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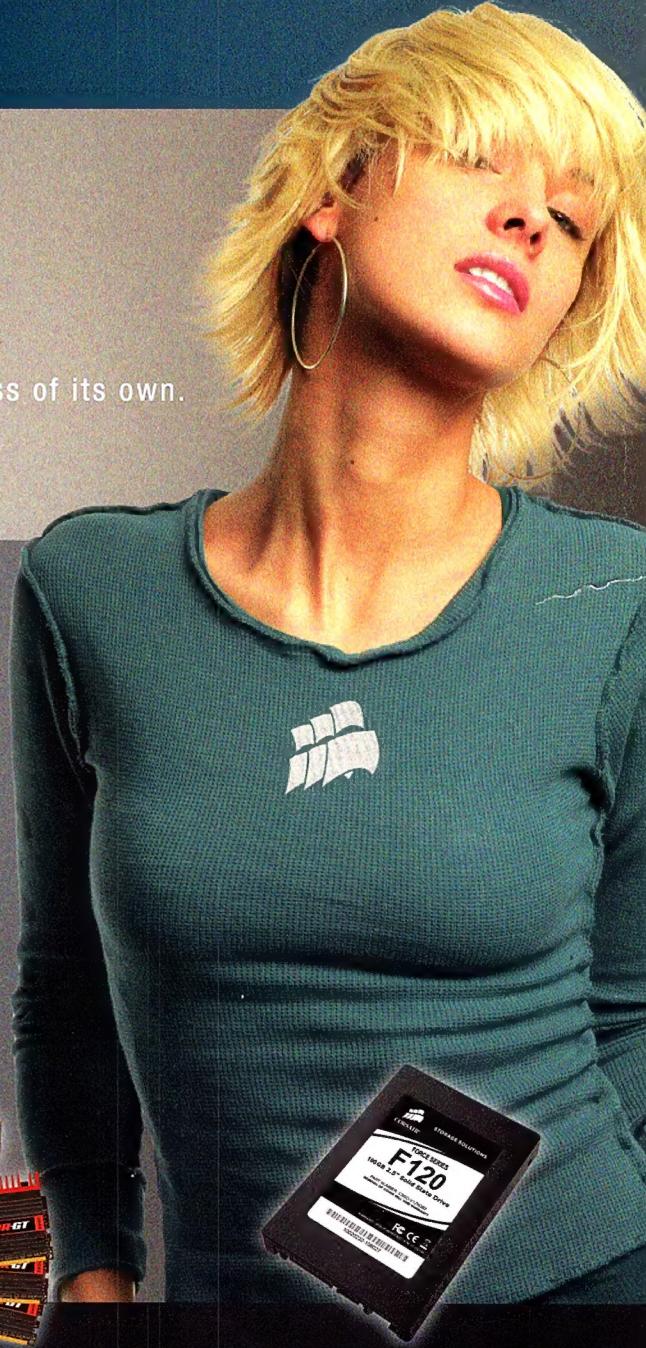
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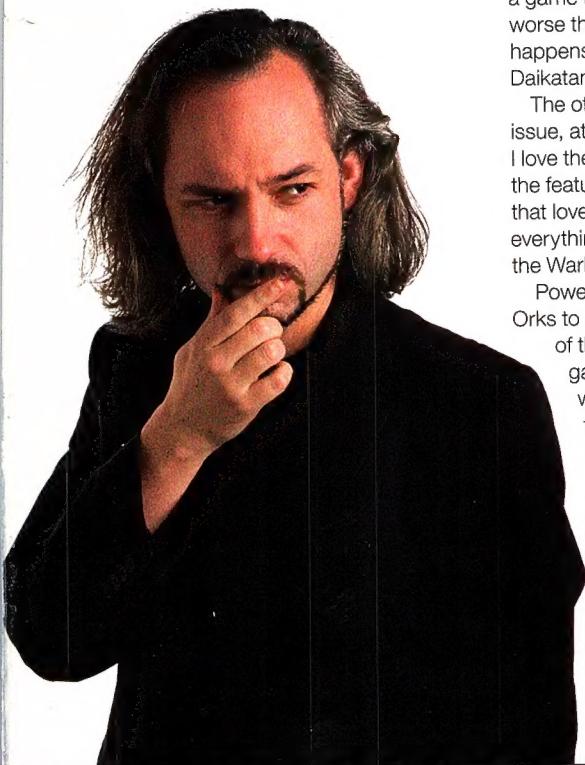
The long wait

Expectation is a harsh mistress.

As reviewers, it's something we've got to be very careful about, especially when it comes to games – even more especially when it comes to games we're really looking forward to.

There are two great examples of that in this issue.

First up – Starcraft II. This is a game that has the weight of twelve years... TWELVE YEARS of expectation riding on it. As I was sitting down to play and review it, it occurred to me just how big a deal this was. It's giant. Likely whole swathes of the South Korean population are as we speak



risking life and limb to finish the campaign in a single sitting. They'll be wearing their fingers to raw fleshy nubs learning the new tech trees and keyboard shortcuts.

Children will be born, and be christened Jim Raynor. Or maybe Brutalisk, which would make a great name.

"Hi, I'm Brutalisk Kwan, pleased to meet you. What? Yes, my parents were Starcraft II fans, why do you ask?"

Hopefully we've sidestepped that, and delivered a truly honest opinion. It's a tough thing when you realise you'll play a game to the end even if it sucks worse than Daikatana just to find out what happens. And no... it's not worse than Daikatana.

The other high expectation game this issue, at least for me, is Space Marine. I love the Warhammer worlds (see the feature on page 72 to see the depth of that love), and Space Marine is looking like everything I could want from a game set in the Warhammer 40,000 universe.

Power armour. Bolt guns. A mess of Orks to kill for the Emperor. But this is one of those great things about being a gamer – that wonderful frisson of wanting a game now, but enjoying the wait as you discover more and more good things about it.

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Australian copies of Starcraft II to include US Battle.net access!

Local copies of Starcraft II: Wings of Liberty to get access to North American Battle.net servers

One important Starcraft update you all want to know about. Starcraft II is out now, and Blizzard's just announced something to please Australian players:

We're pleased to announce that all players who purchase the Southeast Asia/Australia/New Zealand version of StarCraft II: Wings of Liberty will also have the option of playing on North American servers following the launch. While we still encourage gamers to play on the local servers, which will offer lower latency and more action during peak hours, we recognize that many players have longstanding friendships and rivalries with North American players, and would like to continue playing with them. Because of this, we're giving Southeast Asia/Australia/New Zealand gamers access to both regions' servers, so they can choose where they'd prefer to play.

More info's coming on this, so stay tuned to the Southeast Asia/Australia/New Zealand community site (<http://beta-sea.battle.net/sc2/en/>).



Red Faction coming to a small (TV) screen near you!

THQ and US cable network Syfy team up to produce live action Red Faction telemovie.

This might be... interesting



In a partnership that THQ is calling a "first-of-a-kind transmedia deal", Syfy and THQ have just announced a two hour live action movie pilot to air in March of next year called Red Faction: Origins. The movie will be set between the last Red Faction game, Guerilla, and the upcoming Red Faction: Armageddon.

There's some good talent behind the project too. The screenplay has been written by Andrew Kreisberg, who's worked on Boston Legal, Fringe and Warehouse 13, with a story by Paul DeMeo, who handled The Rocketeer.

The Rocketeer! Okay, maybe we're the only one's who still remember that fondly...

And, of course, Syfy - formally the Sci Fi Channel - has an awesome pedigree of quality science fiction. And since this is a pilot, success will likely mean an entire series of building smashing action. Bring it on.

FROM ATOMIC ONLINE

It's that time of again - no, not that one, but the one where we get to celebrate the awesomeness that is the Atomic Community.

So, without further ado... who gets 'the stuff'? What stuff? Why, a shiny new Imperator Mouse from Razer, of course! Razer's come on board to be our new POTM sponsor, and there'll be a different bit of Razer gear given away each month for POTM. Woot, we say. Woot.

Anyway, back to the who... And the who this month is...

lew~! Who walks away with the rodent for his excellent and discussion-provoking thread on putting together a new NAS.
<http://forums.atomicmpc.com.au/index.php?showtopic=32395>

Well bloody done! But, there's always more awesome. Here are the wonderful runners up.

tantryl delivers the app goods with an excellent guide iPhone stuff for Atomicans.

<http://forums.atomicmpc.com.au/index.php?showtopic=33299>

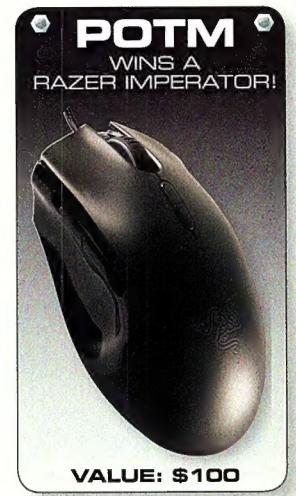
And **frawlz** shares some random old man insights with us. Bless.

<http://forums.atomicmpc.com.au/index.php?showtopic=33087&st=0&p=666386#entry666386>

Finally, a personal shoutout to **twinair**, for starting a fiendishly useful and frank discussion about Atomic itself. Cheers.

<http://forums.atomicmpc.com.au/index.php?showtopic=34115>

Thanks again, all.



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Sony Cybershot DSCWX5

Price: TBA **Website:** www.sony.com.au

As long as we need to put on glasses to see it, we're not going to be 100 per cent sold on 3D technology, but that's not stopping Sony from 3D-ifying everything they can.

Hence the Cybershot WX5: the world's first stills camera capable of capturing 3D panoramas. Simply point, shoot, sweep, plug camera into compatible 3D TV, put on 3D glasses and enjoy.

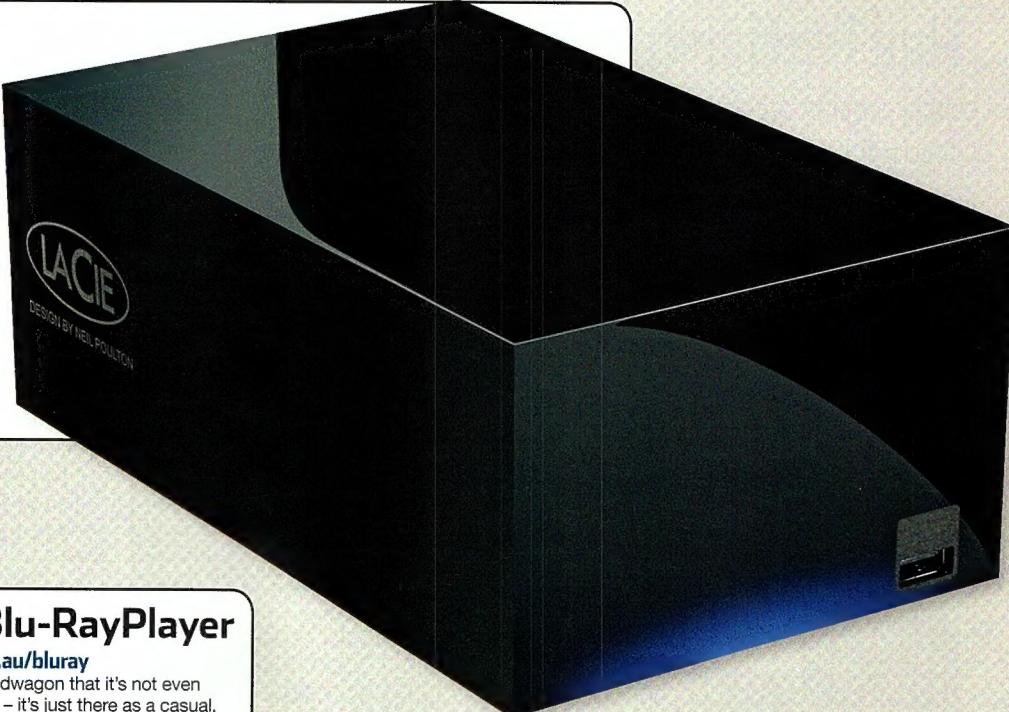
It might be a seem a little gimmicky, but 3D panoramas aside, this is a pretty nifty compact camera, with a 12.2mp sensor, the ability to shoot 10 photos a second in continuous shoot mode, and full HD video recording. Sure, you're probably paying a premium for the 3D thing, but if you've already invested in the 3D TV you need to view the photos – and don't mind the glasses – you're probably not too worried about that.

Lacie Network Space Max

Price: \$699 **Website:** www.lacie.com/au

Storage is one of those things: you always need more. No matter how much you have, and no matter how much you buy, it always seems to fill itself up with stuff much faster than you imagined.

Thankfully, the good people at LaCie are always happy to help you find ways to satisfy your cravings. The Network Space MAX is a shiny black box of double hard drivey goodness, that can be configured to store lots and lots of stuff (RAID 0), or store a bit less stuff more securely (RAID 1). Don't worry though; that bit less stuff is still a generous two terabytes. Happy hoarding!



SONY BDPS570 Blu-Ray Player

Price: \$279 **Website:** www.sony.com.au/bluray

Sony have jumped so far onto the 3D bandwagon that it's not even the key feature of their new Blu-ray player – it's just there as a casual, throwaway aside.

The key feature would be the internet connectivity, allowing you to stream BRAVIA Internet Video content from 19 channels, with more being added all the time. The BDPS570 can even do it all wirelessly, thanks to built-in WiFi.

It's also got USB inputs, DLNA PC streaming, full HD 3D and boots up ready to go in 3 seconds. Which is faster than we can ask if you saw what we did there with the casually chucking in the 3D? Well, did you?





Samsung Navibot

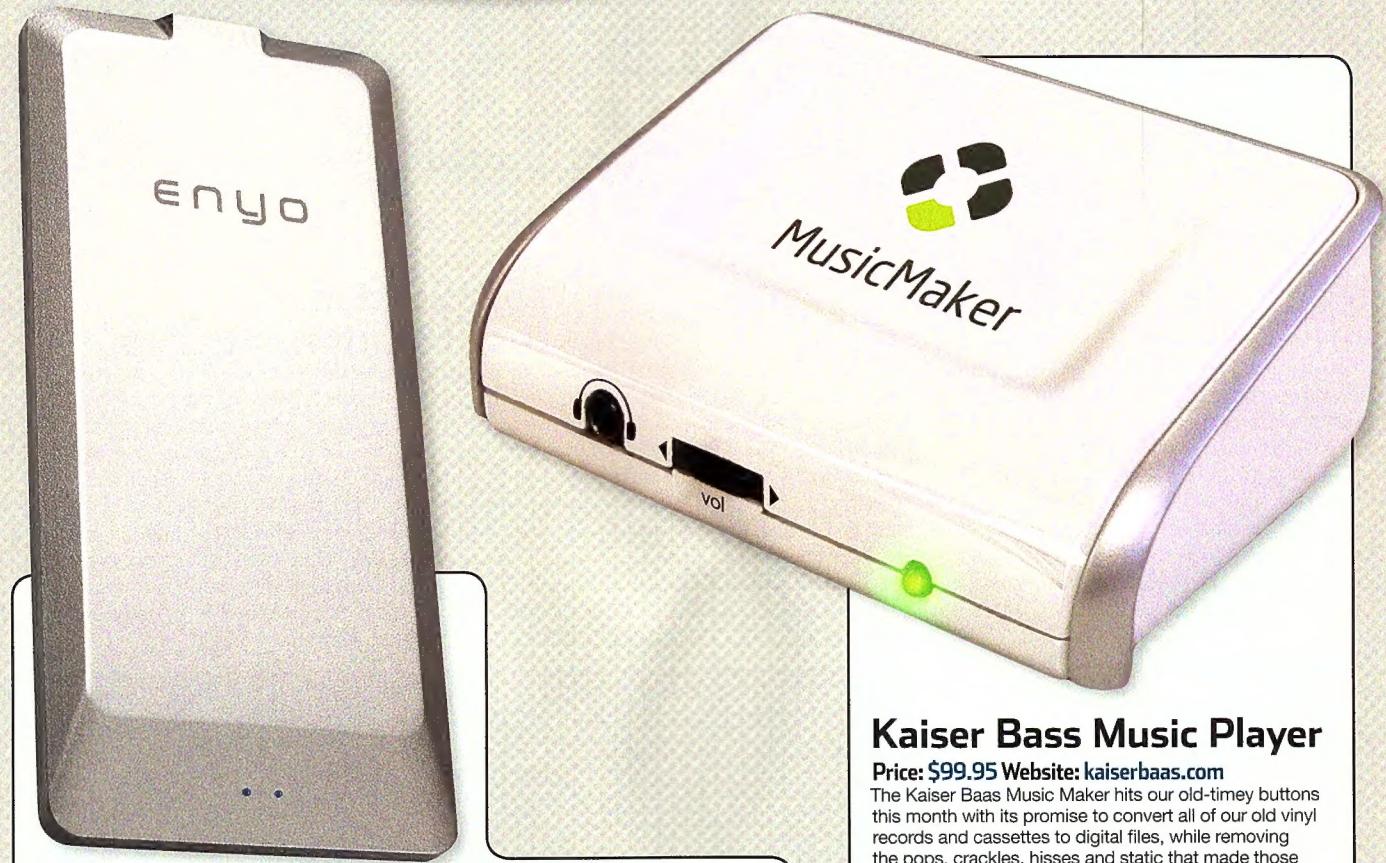
Price: \$999 **Website:** www.samsung.com/au

If you were ever wondering about our views on cleaning, you should swing by the Atomic offices and ease your mind: we're not fans.

This is why the Samsung Navibot makes us happy in a way that household appliances can rarely manage.

This little beast maps and then vacuums your house all by itself. It's fully programmable, and once it's done it very cleverly puts itself away, because it knows that if it were up to you, it would sit by the couch until you stubbed your toe on it, swore, and kicked it under the dining table with your other foot.

We're still waiting for a gadget that sorts and then puts away our laundry, but in the meantime, at least said laundry is piled up on a clean floor.



OCZ Enyo 128GB USB 3.0 SSD

Price: \$550 **Website:** www.ocztechnology.com

As well as being blazingly fast – with write speeds up to 200MB/s – the Enyo 128GB is what OCZ are calling a 'portable SSD'.

This means it's basically a USB flash drive, but a USB flash drive that has consumed copious quantities of steroids for extra speed and capacity, then gone on a diet to trim down to a lightweight 88 grams and a handy pocketable size, and then gone and dressed itself in an anodized aluminium shell suit for extra protection from the elements (and your clumsiness).

If we had our way, that shell suit would be something other than all-work-no-play grey, but even we have to concede it wears it well.

Kaiser Bass Music Player

Price: \$99.95 **Website:** kaiserbaas.com

The Kaiser Baas Music Maker hits our old-timey buttons this month with its promise to convert all of our old vinyl records and cassettes to digital files, while removing the pops, crackles, hisses and static that made those vintage lo-fi formats so annoying (or special, depending on your point of view).

If, like us, you've got that random wine crate of mix tapes in the back of your wardrobe that you don't know what to do with, but can't bear to throw out, this might just be the device you need to help you cut the cord. On the other hand, you might lose a weekend to a bottle of whiskey, a renewed affection for mix tapes you haven't listened to in 15 years, and too much energy wasted on wondering whatever happened to that girl (or boy) you loved when you were fourteen ... sigh...



The real bio shock

Jake Carroll unravels the secrets of bioinformatics.

When it comes down to it, we're all just strings of information made up of millions of lines of code, programmatically selected through some natural process. Our appearance, physical and mental characteristics, and even our behaviour are the result of some specific organic mathematics, more commonly known as genetics. This month, we're going to deal with theses particularly weighty concepts and how computing technology makes sense of the millions of lines of code that make up each and every one of us. Not Justin 'The Frun' Robinson, though. That guy is just weird.

Understanding the Genome

Getting your head around the enormity of genomics needs some explanation. The genome is the catch all term for the entirety of an organism's hereditary information. The encoding or way that the genome is put together is through DNA (Deoxyribonucleic acid) or RNA (Ribonucleic acid). DNA and RNA are often compared to recipes or software because they contain the specific instructions required to form cells and proteins. Sort of like a primordial code.

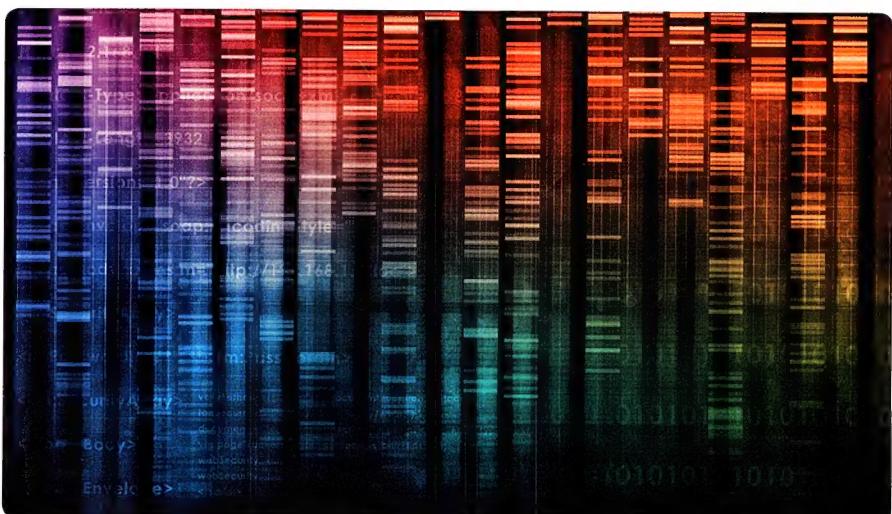
DNA/RNA consists of two polymers of building blocks called nucleotides. They have structural branches known as backbones made up of phosphates and sugars. The sugars are in turn connected to one of four types of specific molecules called bases. These might be analogous to classes in C++. It's this

specific sequence of these four bases along the backbones that encode information, like a one dimensional array in C-type languages. This is the very bit that makes us unique. This information is read and represented using genetic code (Adenine, Cytosine, Guanine and Thymine) that specifies the sequence of amino acids within their proteins. In the building blocks of our bodies, plants and animals, within our cells, the DNA is organised into long structures called chromosomes.

So with the size and complexity of the genome (partially) understood, we need to move on to applying some CPU cycles to all of this.

Send in the bioinformaticians

The last few decades have created massive advancements in genomic and molecular biology research technologies. Plenty of data is generated when such advancements are made, and as every day passes, we refine algorithms and mathematical models to make better predictions and present more accurate results – but at the cost of generating even more data. Consequently bioinformatics now entails the creation and advancement of databases, algorithms, computational and statistical



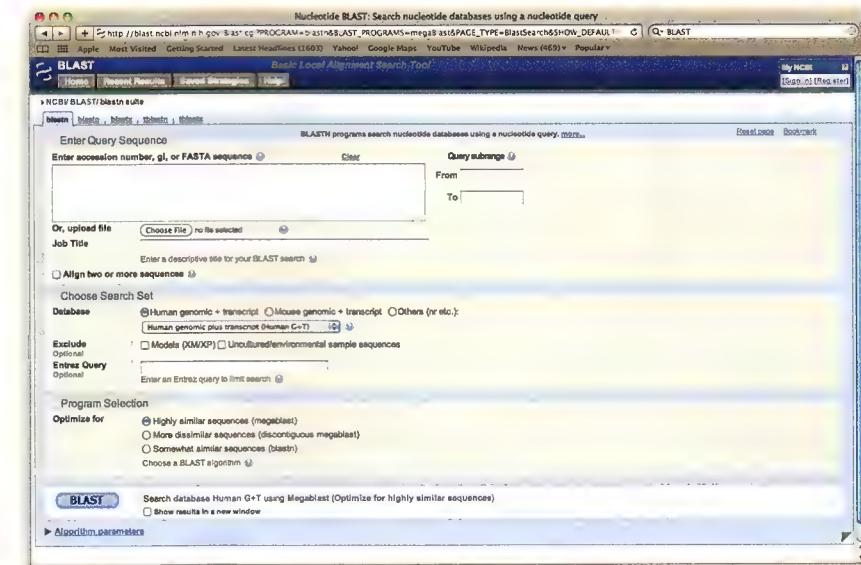
techniques to solve formal and practical problems arising from the management and analysis of biological data. How much data are we talking exactly?

Atomic interrogated a source close to the high throughput sequencing industry for figures from a research lab genetic sequencer pertaining to the raw data it produced. The results were complicated – but it boiled down to around 36TB of data for a human genome sequenced in 3.5 days. Later in this article, we'll explain how this much data exists and how it is generated.

When it comes down to it, this genetic math has the primary goal of increasing understanding of biological processes and problems. The ways in which computers are actually helping us to do this include:

- Pattern recognition
- Data mining
- Machine learning and Artificial Intelligence (by way of self adjusting code)
- Visualisation

Given the quantity of data being discussed, it became impractical long ago to do any of the counting in any given sequence manually or 'by hand', hence we turn to software. One of the most famous software engineering projects specifically designed for parsing sequences and



BLAST web services, allowing remote users to upload sequence files and apparently meaningless long strings of data, spitting statistical significance out the other side in a friendly 'Web 2.0' style interface.

sifting through billions of nucleotides is BLAST, or the Basic Local Alignment Search Tool. The software compares sequences to known sequence databases and then calculates the statistical significance of matches or 'hits'. At this

point, if there is a significant amount of similarity in hit1 and hit2, we can infer functional and evolutionary relationships, even helping to identify new members of gene families.

(<http://blast.ncbi.nlm.nih.gov/Blast.cgi>)

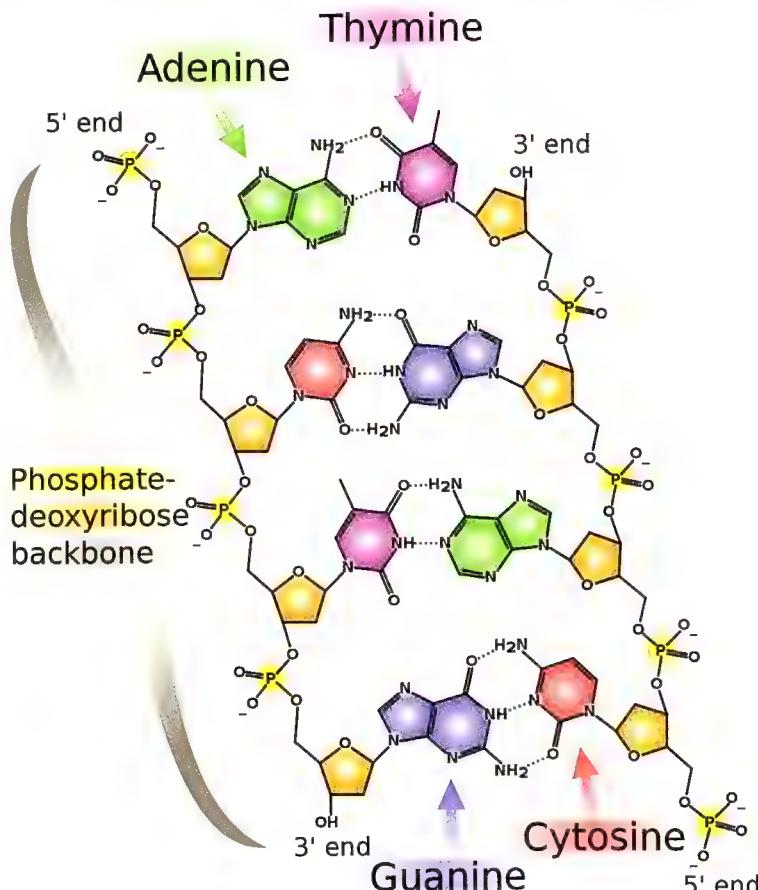
When the stars don't align

As we mentioned beforehand, plenty of this crunching is about matching things up, comparing things and then working out if the similarities found in sequences are statistically significant. However, there are ways to shorten the task. One of those ways is a concept known as shotgun sequencing. This doesn't produce massive whole chromosome datasets; rather, it generates sequences of many thousands of small DNA bits that have been fragmented. Through a bit of poking and jiggling in software such as DNASTar's LaserGene or the Broad Institute's Integrative Genome Viewer (IGV), we can put the fragments end to end so that they overlap and, pushing them around a little, align to make a full correct genome.

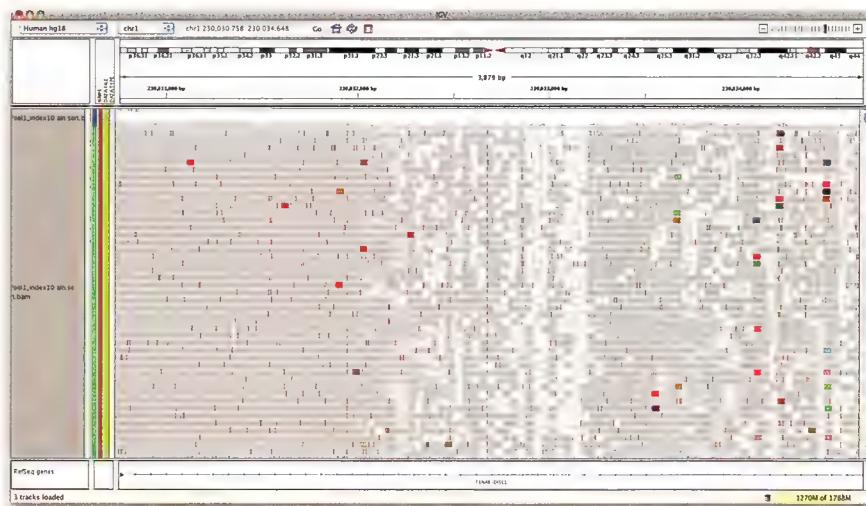
Unfortunately, the job is still pretty large for wide genomes, such as that of a human or a potato. A human genome is around 3.3 billion base pairs, with a potato being around a quarter of this, near 840 million.

Serious iron

Most people expect that the biggest iron is busily computing the current and flow of oil spills down the Gulf of Mexico, or the amount of the El Nino years between droughts – but a large proportion of the world's most powerful compute cluster systems are working on genetic sequencing problems too. The problem with compute clusters however, given the problems of genetic sequencing, sequence alignment and statistical analysis, is that cluster computing isn't always



The most simplistic representation of DNA, showing all the amino acid combinations and bonds that make up the syntax of a gene sequence.



The Integrative Genome Viewer from the Broad Institute.



Plenty of readers will be wondering how really long strings of A, C, G and T somehow translate into the world's largest .txt file.

an efficient means to calculate what needs to be calculated with genetic type problems. Put simply – compute clusters aren't always the right shape to perform these calculations as quick as they possibly could.

Cluster versus Super Computer

There is a fundamental difference between a compute cluster or 'grid' of compute nodes and a super computer, in the classical definition. A cluster high performance computer, as you'd see in all those jazzy photos of extremely large and expensive data centre installations, is highly susceptible to the parallelisation affinity of a workload or the ability of the mathematics taking place to be decoupled, split into little blocks of work, then reformed back into the original workload or process to find a 'solution' at the end. These types of problems are often considered 'embarrassingly parallel'. In the world of bioinformatics, BLAST searches fall into this category.

The 'other' type of super computer is a different beast. Utilising large homologous memory architecture and paths back to CPUs, as well as much faster interconnects, a typical singular purposed supercomputer is oftentimes a custom engineered environment, rather than commodity CPUs, such as Intel's Xeon, or AMD's Opteron in the standard blade/pizza-box scenario we'd expect. These super computers, as a result of their extremely low memory to calculation/pipeline latency and seamless networking interconnects have the ability to solve problems that decouple poorly, or those that have significant dependencies in mathematical transformations more efficiently than a computer

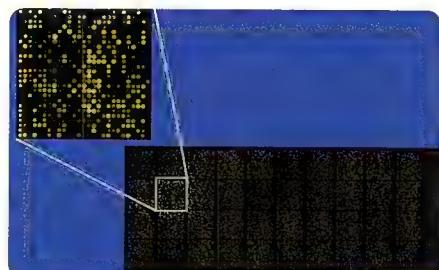
cluster. Large base reads and visualisation of gigabytes, much less terabytes of data in a graphical form, are a case for monolithic and classical-supercomputing capabilities. Unfortunately, due to the cost involved in niche components, high density RAM modules and highly specialised networking interconnects (such as 40GbE, Infiniband and beyond), these technologies are beyond the reach of most end users, much less researchers or scientists.

Drawing pretty pictures

Plenty of readers will be wondering how really long strings of A, C, G and T somehow translate into the world's largest .txt file. The simple answer is – they don't. Next generation sequencing, analysis and bioinformatics computing achieves the high throughput and

amazingly fast full sequencing process through optical means. The sequencer looks at things, then uses optical character recognition of a form to generate results. It's these optically sensed images that are then converted to high-resolution TIFF images from a very sensitive CCD, and are then in turn analysed to understand the DNA markers and image intensity to eventually output sequence data in the now familiar form of amino acids marked with A, G, C, and T.

The resulting information that is generated from the intensity of light is put into tables and graphed so it can be visualised to see trends in genes. This can lead to an appreciation for mutation, similarities between families and even comparison from one species to the next. A researcher might be able to take a pumpkin, then look at its heat map of genetic markers compared to a breed of gourd which is resistant to pests, then look at the similarities. From these similarities, a researcher might then be able to isolate likely functional genes in both to give the pumpkin the same hardy characteristics as the epic pest-proof gourd.



The ultra high-density DNA oligonucleotides of a specific genetic sequence. These arrays allow high performance computing platforms to efficiently compare and determine statistical significance in sequences.



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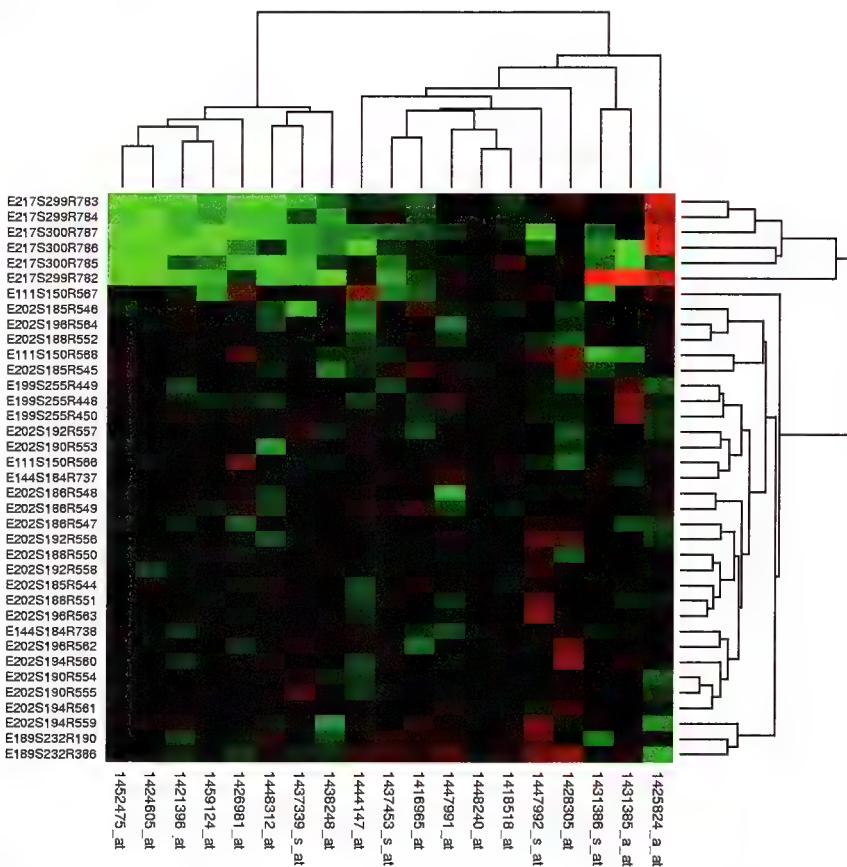
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Genetic heat map showing different gene expressions and markers from a microarray run through a statistical analysis package on a computer.

The future of computing

A term often bandied about in research circles is 'genetic algorithms' or 'DNA computing'. As we get larger and larger in our transistor count, yet smaller and smaller in our fabrication and die sizes, we have to continually outsmart the laws of physics to keep things cool and sensible. With DNA and the biochemistry that takes place within cells, chromosomes and genes, we're already at a tiny scale, but we're there organically.

In 2002, a programmable DNA computer was unveiled inside a lab in Israel. It was composed of a set of enzymes and DNA molecules. The idea was that a researcher could inject the 'computer' into a cell, then turn it on. Once turned on, the researcher could then probe the computer to find out based upon a binary logic gate whether or not the computer had detected cancer inside the cell. If it had, another logic gate could allow or deny a cancer-fighting drug to be released from the computer itself.

Things have become less theoretical and more practical since then however. In 2009 a stand-alone biocomputing system was coupled with a generic silicon chip for the first time (on record). An enzyme was constructed based on an OR-Reset/AND-Reset logic gate using field-effect Silicon chips. Thus a new concept was

born, known as synthetic biology and inter-cell electro-mechanical systems.

The capabilities of DNA computing

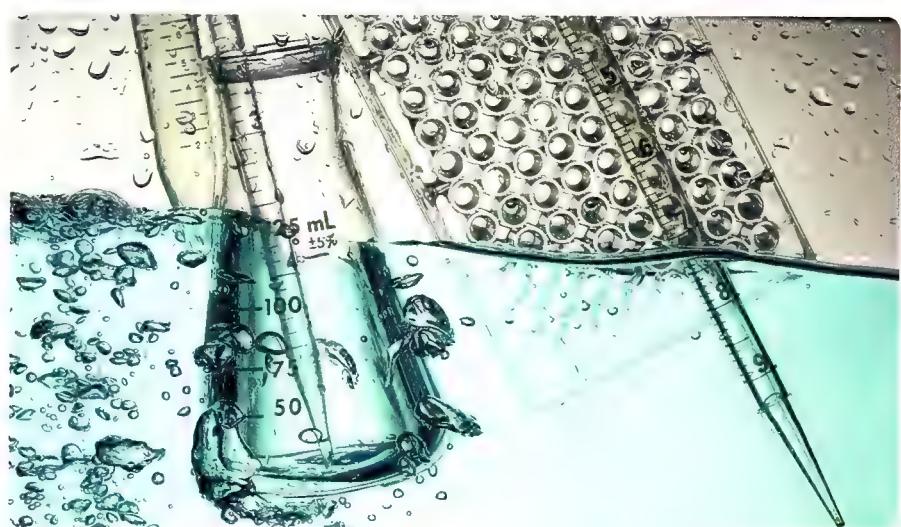
It seems like reinventing the wheel, but DNA computing represents similar leaps in our ability to do things 'all at once' in a similar way as per the concept of parallel or cluster computing. An advantage of DNA computing is the many

different molecules at the disposal of the compute pipeline, allowing a calculation path to try many different combinations of a task, function or algorithm. Scaling in molecules, not scaling in CPU cores. Obviously, DNA computing doesn't currently use as much power as computing in the traditional sense with copper/gold/silicon CPUs.

As one would expect, for certain highly specific problems, DNA computing is much faster than any computational devices we have in the present time. Similar to quantum computing, with its concept of multiple state tenancy, there are ways to solve problems involving parallel mathematics that simply can't be solved easily without the low latency that cell-and molecule-based interactions can obtain.

We aren't actually out of the woods though, in terms of computational or computability theory. If a problem still suffers from flaws in computability theory, it'll still be stuck fast by the same laws with a DNA computer.

There is a brave new world ahead of us where genetics, DNA and the very things that make us up might soon be adding up our monthly electricity bills or helping us download the latest tunes for our iAddictiveElectronicAccessory. With the advent of full genome sequencing, it's now entirely practical for a semi-wealthy human being to know exactly his or her genetic traits, understand what, if anything, will be the likely cause of their death, how their children might benefit from the mixing of genes and ultimately the risk they take every day in living the lives they do. The moral implications that go with the use and disclosure of such data are profound, and, even if it's a little clichéd, beg bigger questions to be asked. Given computing power is the key driver to the speed at which people can have this information in their hands, and ultimately, the catalyst that is bringing the cost of this information down, we have to wonder if our own innovation is becoming the very thing that leads to a world where nothing is secret anymore, ultimately creating a counter culture in the process.



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The way it's meant to be played?



Ashton Mills has a few things to say about game DRM.

Recently Rod Cousens, the CEO of Codemasters, went on record as saying that DRM was a bad thing and that publishers should instead sell 'incomplete games' (his words exactly) that instead charge gamers as they purchase the missing parts to get the full 'experience'. According to Cousens this would reduce piracy as the game could be cheaper at retail and those who want the full game (tied to micropayments of downloadable content) will pay for it while those who don't won't.

Well let's give him points for recognising DRM for what it is, a system that treats legitimate customers as criminals, as he also noted that

system ostensibly designed to increase sales, except it does the opposite for a lot of us. It's not rocket science: treat your customers with respect and they'll respect you with their custom. That's why they're called *customers*.

But Cousens is actually on to something, though I don't think he understands for himself quite how. It's not a bad model, actually, to release an 'incomplete game', if you do it right – because it's not the first time it's been done. In fact it's been a very successful model.

Cast your mind back to 1987 and Apogee software, who published gems like Commander Keen and, of course, the franchise from which

The presumption is that everyone who bought your game is a thief; why else would you need to be constantly checked for legitimacy while playing?

giving your customers a bad experience like this isn't going to help your bottom line.

Ubisoft is the worst offender here – its new online DRM system that requires you to be constantly online while you play, even for single player games, or be booted off your own game is the ultimate example of arrogance and stupidity. The presumption is that everyone who bought your game is a thief; why else would you need to be constantly checked for legitimacy while playing? And as we recently found out it doesn't help that the loyal gamers who forked out their hard earned cash for games then got to be denied the ability to play them thanks to Ubisoft's servers being down or inaccessible.

Settlers 7 and Assassins Creed 2 are two recent examples of this DRM. I own neither of these games, despite liking both (I've played The Settlers since the very first version), and will not buy them for as long as this system is in use. Ubisoft's DRM causes a lost sale for me, and I know I'm not the only one. Amazing isn't it? A

an entire industry was spawned: Wolfenstein 3D. There, Scott Miller, one of the founders of Apogee, and who was later honoured as one of the Most Influential People in Gaming History (perhaps he's someone to listen to, eh?), built on the shareware concept to release the first chapter, or episode, of a game completely free. A full, unrestricted, game – but just the first part.

This propelled many of Apogee's games to success and iD later followed suit with DOOM. Granted today we have demos, but most usually provide just a small sample of gameplay, and often restricted in some way. Ultimately demos can be informative, but don't leave you with the emotional attachment a free first chapter does, and for two reasons: firstly there's usually a deeper and fulfilling experience of the game, being unrestricted; and secondly you could always pick up where you left off when buying subsequent chapters, which you can't do with demos. You're not likely to feel like playing through whatever sample you were given from a

demo all over again, but with the full first chapter of the game complete, you have an emotional investment in your success so far, and you're more likely to want to finish what you started.

This is a model which can and does work. Having a good product at a good price is also integral to the equation, as it is for *any* product, but it's certainly preferable to nerfing a game and selling parts of it back to you, and certainly preferable than any sort of intrusive DRM to try and prevent lost sales (and which then often causes even more lost sales, anyway).

There is a holy grail out there, but any system that rubbishes the experience of the customer is doomed to fail. Codemasters and Blizzard among others know this, but it's a lesson Ubisoft is yet to learn. ☺

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Dan Rutter brings the answers to your questions like no-one else can.

I/O OF THE MONTH

8GB ought to be enough for anybody

I built my system about a year ago now and it is nice. 8GB 800MHz DDR2 RAM, 3GHz Core 2 Q9650, 1TB Seagate and a Sapphire 4870X2 all plugged into MSI P45 motherboard.

My question revolves around the virtual memory used by Windows (I use Win7, 64-bit). Why is VM used when I have a stack of RAM?

I know I can turn it off, or lock down a smaller amount of VM, but for whatever reason Windows seems intent on using it. What options are there for speeding up the VM function?

Shane Regan

O You can probably get away with turning off the swap file. But it's not really a great idea, and may leave you with a slower computer, for some tasks.

There are actually two concepts here – virtual memory, and the paging or swap file (or files).

Virtual memory is the translation layer between programs and the real, physical memory. Every program sees a nice flat hole-free block of unshared RAM, and uses that space however it wishes. The OS then maps this idealised, 'virtual' memory onto the actual physical memory in the computer – the RAM, and normally also the swap file(s).

You can't disable virtual memory in any remotely modern computer. Doing so would throw you back to the Before Time when a Memory Management Unit (MMU) was something advertised in big text on the product brochure.

So what are you actually doing when you disable the swap file?

Well, with no swap file, you definitely won't ever be waiting for data to be paged into or out of swap. But the down side of this is that data never can be paged in or out. So you need enough physical RAM to handle everything that every program asks for, all at once.

Which is, demonstrably, doable. Look at ye olde Win98 box with 512Mb of RAM: that was more than most users ever needed, and could run swapless perfectly well.

Drive [Volume Label]	Paging File Size (MB)
C: [Hitachi1tb]	None
E: [Samsung1]	None
F: [Samsung2]	None
I: [Hitachi2tb]	None

Selected drive: C:
Space available: 186434 MB

Custom size:
Initial size (MB):
Maximum size (MB):

System managed size
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Set

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I/O OTM

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as a back-lot warehouse for data that some program put in memory once, hours or days ago, and hasn't looked at since. Paging that data out to disk gives you more free physical RAM. And modern OSes use that free physical RAM to make the programs you're actually using now faster, mainly via disk caching.

You also really, really don't want to blow your memory budget, even if you've got enough RAM that it's pretty hard to do. A hard out-of-memory error (which can also happen if you cap your swap-file size and manage to blow that budget...) is a showstopper. The computer can't just murder some random task to claw back enough memory to tell you that it needs to claw back a lot more memory. Instead, it'll just hang, and you'll probably see one of those malformed errors you get when there aren't even enough system resources to put text in the error box.

With 8GB, though, there's an excellent chance you'll blow the budget seldom or never. So feel free to give it a shot.

Don't just fall victim to placebo effect, though. Bust out the stopwatch and see whether tasks that matter to you are really faster with swap turned off. ☺

Insuff

Virtual memory uses the swap file

...but then you're not allowed to complain about this.

Crimpology

I I recently found out that a stuck Molex plug really can rip the whole power connector off a DVD drive. So I'm upgrading some PSU plugs to 'Easy-Grip Internal Power Connectors', with a bit that you squeeze to push the plug out of the socket.

The new plugs don't come with pins, but they include a tool to remove the pins from the old plugs so you can slide them into the new ones. I've noticed that all of the pins are just crimped onto the end of the wire, not soldered in place.

Is this just a money-saving measure? Does anybody make a PSU that has soldered connectors as standard? When I buy my next PSU, I'd prefer that.

Harry Govett



The good kind of Molex plug probably costs a whole five cents more.

O Yes, PSU-plug pins are always crimped on. So are other similar connectors, like the ones in automotive wiring looms and on R/C-model battery packs.

This is partly because crimping is indeed usually easier and cheaper to do than soldering, but it's mainly because crimping is *electrically* superior to soldering.

A good crimped connection won't have resistance any higher than a soldered one – actually, it may be marginally lower – and it shouldn't be any more prone to mechanical failure, either. Solder joints often wick some solder into the wire on either side of the joint, stiffening it and encouraging stress fractures just beyond the solder. Crimped joints leave the wire as flexible as possible.

That said, it's usually fine to solder instead of crimping. For really *immense* current flows, like in high-powered R/C models, crimping can give you a little more power, but this doesn't matter for even a seriously stacked PC. 'Amateur' crimp joints that've been made in a vice or with ordinary pliers are also likely to be of much lower quality than joints made with a proper crimping tool. You're likely to get a better result than this from soldering, unless your soldering procedure involves a Bic lighter.

You'll occasionally also see joints that are crimped *and* soldered. The usual reason for this is corrosion protection. If you don't have the right crimping tool, though, crimping with pliers and then soldering the flimsy crimp will give you a solid connection.

PSU-piling

I I want to build a learn/test/play environment for home. I plan to build a custom chassis and populate it with three bare machines (motherboard/CPU/RAM/NICs) + GB switch + KVM + boatload of HDDs. One machine will operate the drives and provide iSCSI to the other two machines, which will be running clustered Hyper-V with a boatload of VMs. All of the machines will be relatively low power consumption – under 120W max, not kW multi-SLI monsters.

My question involves powering this setup. I'd like to put two beefy (650-850W) PSUs in a redundant (hot/warm) configuration, and I'd like to do it for a minimum of cost/waste. I know I can buy server cases that do this, but the first thing I'd do with that kind of high-end case is gut it to get the PSUs and electronics out. I'd prefer to buy a custom PCB with two inputs/three outputs, with all the circuitry for cutover already in place. Does such a thing exist?

If I wanted to build it, will I need an EE degree? I imagine there are custom ASICs and such that I'd have to integrate to do the cutover, and all sorts of AC filtering mojo that's way beyond my skill set.

If the answers to above are all negative, could I hack together a two input/two output (hot/hot) solution by using vampire clips to tie all the wires of two PSUs? Or is this likely to result in lots of magic blue smoke?

Randy Steck

O I haven't a clue whether anybody makes an off-the-shelf PSU redundant-iser.

Fortunately, I don't think I *need* a clue in this situation, because you can buy redundant PSUs off the shelf. They're usually priced for the enterprise-server market, and you won't necessarily be able to mount one neatly in a standard PC case, but both of these problems are solvable.

If it's got standard output connectors, it should work. And for your relatively un-demanding application you should be able to just use plug adapters if you need to turn 20-pin ATX into 24-pin ATX, or add more EPS12V plugs, or whatever.

In the olden days, server PSUs were a lot more likely to have outlandish proprietary connectors (so did some non-server PSUs, for that matter – beware old Dell power supplies...), but that problem's much less serious now. And spare parts for older server models have always had an odd price distribution: super-expensive, if you must have that part to keep your mission-critical hardware running; or super-cheap, if it's a part for which no such suckers can be found any more.

Running three parallel computers off the one PSU is a separate problem, but probably not a very serious one: <http://bit.ly/polypsu>

If you've got a lot of stuff that all powers up at once then the aggregate draw on power-on could be a problem; you may need more PSU wattage than you expect, especially if you can't stagger HDD spin-up. (SCSI drives should all be able to do staggered spin-up, perhaps with a simple jumper setting. ATA drives, not so much.)

Do NOT just connect power supplies in parallel. It's possible to make this work, but it's not as simple as it looks:

www.dansdata.com/io086.htm#2



When in doubt, just add more power boards.

Imagine a world saved by software

Microsoft's Imagine Cup is a big deal: Justin Robinson discovers just how big a deal it can be.

Only a few short weeks ago, it was a stretch to believe that software could have an impact on the world; faceless corporations are ultimately driven by profits, revenue and the bottom line, leaving a void that isn't likely to be filled quickly. This is where the Microsoft Imagine Cup steps in.

From a pool of 325,000 individual entries Microsoft chose 400 of the absolute best and brightest minds in the world, each currently studying at universities all over the globe. These minds (and the bodies they reside in) were then flown to the city of Warsaw, Poland, where they competed against each other in a race

to respond to the challenge: "Imagine a world where technology helps solve the toughest problems."

The answers to this challenge are in many cases surprising; if not for the technical wizardry on display, then simply for the sheer selfless attitude of some competitors. In stark contrast to money-driven companies, many of the competitors never intended to profit from their solutions at all.

With this in mind, and an invitation from Microsoft to attend the event, we found out exactly what the Imagine Cup could produce – and the results are sure to surprise. After all, there can only be one real winner: the human race.





OPENING CEREMONY

The first day of the show began in true European style as Microsoft secured a large carpark in the centre of town. Within the boundaries of this area lay a large stage, complete with full lighting control, a gigantic LED screen and high definition video crews. Four hundred competitors waited with expectant glee as they posed for photographs on the steps of Warsaw's Palace of Culture and Science building, and all had registered their attendance at the show which was due to begin in only minutes. As with most of our international trips, our visit to the Imagine Cup wouldn't be possible without the support of our good friends at Microsoft.

Competitors had made it through a tough selection process to be part of the Cup, and after a short introductory welcome from select Microsoft staff and the Prime Minister of Poland, local band *Zakopower* took to the stage. They played what can be best described as "traditional polka infused with techno beats and mad clarinet solos", accompanied by eclectic singing and an array of atypical instruments. We were not far from the centre of town, and before long became surrounded by locals who pressed in close to enjoy a free concert – *Zakopower* is apparently A Big Thing™ in Poland.

Categorise this!

The Imagine Cup is not just about concerts and partying; it's also about having a positive effect on the world, as Jon Perera of Microsoft Education explains. "Every person on every team deeply believes that they're going to make a huge difference in this world." Across the five categories and six awards that make up the show, the contestants receive some real value



from the Cup.

"They have to have an idea, make it work, then they have to sell it," said Rob Miles, Software Design Captain. "If you make them go through that experience as students, and they look for places to work, when [they talk] to employers it's fantastic. They don't know how much they've gained until five years down the track."

Some of the competitors have fought real battles to attend the Cup, such as the United Kingdom Embedded Development entrant



whose university refused to support teaching Microsoft tech like .NET or Visual Studio, meaning he had to learn it himself, or two whole teams who had to present via videoconference as their visas were not approved in time. Knowing that they've all worked hard to be here, let's take a look at what they've achieved.



ROUND 1: WARSAW

The Cup kicked off on a bright, sunny day, with the first round of presentations from each of the teams in Software Design, Game Design and Embedded Development. Software Design alone had 68 teams from which to choose, and though it was the most popular category, some would argue that it wasn't the hardest.

"The students are given a generic embedded platform that they actually have to work with in software, build an operating system specific to that device, and then build code to run on that device" explains Scott Davis, Embedded Development Captain. "Of all the competitions this is the only one that requires deep knowledge not only of the software, but also of the hardware."

Regardless of who has it toughest, the quality bar has been placed incredibly high for all the competitors. "We had more games entered in the competition this year than we've seen in the last twelve months [for mainstream consoles]", exclaims Andrew Parsons, Game

Selection Process

The process for weeding out teams from the original bunch of 325,000 is a complex one, though it boils down easily enough. An initial round of applications are entered at the conceptual design stage, with the best entries chosen for regional winners, who are then selected for the finals in the host city – in this case, Warsaw. Previous years have seen the finals take place in Cairo, Paris, Yokohama and Barcelona to name only a few.

While attending the finals, teams face a first round of presentations where they are judged on criteria such as technical proficiency and appropriateness of their entry before a panel of four judges, typically industry experts, before being filtered for a second round. This smaller grouping again presents their entries in front of a panel of eight different judges, and ultimately, a winner is selected for the five categories of: Software Design, Embedded Development, Game Design, Digital Media, and IT Challenge.

There are a further six awards into which teams can enter their projects as an extension of their initial entry: Envisioning 2020, Internet Explorer 8, Interoperability, Next Generation Web, Touch & Tablet Accessibility, and Windows Phone 7 "Rockstar".

As a minor requirement, all entries must use at least one Microsoft technology. As a slightly larger one, they all must try to answer one of the United Nation's eight Millennium Development Goals, seen online at www.un.org/millenniumgoals/



Design Captain. "The videogames that these students come up with all have an educational element about some of the really tough problems faced in the world."

Presentations begin

Proceedings moved into the Palace of Culture building, where we sat in on many different presentations given by the different teams. First up was the team from Belgium, *NomNom Productions* and their game, *Shift*, which placed second in the Finals. Contained within a relatively small 30MB file structure is a title built using XNA, the standard set of design tools given freely to students by Microsoft through the DreamSpark program. *Shift* is based around a village situated on a small central island, itself surrounded by a group

of smaller satellite islands.

These satellites represent four different primary needs of the village, such as access to food and clean water, which are each reduced over time. Attention must be spread between the competing needs, and the player interacts with the problems with simple Reversi-style minigames. The team explains, "the puzzle aspect is good for a game because we didn't want to make [it purely] educational; it's subtle."

The gameworld is cartoony and brightly coloured, using clean shapes that are designed to be open and appealing. Gameplay quickly becomes challenging, as the minigames must be left half-completed to manage all the problems that face the village. There is also potential to expand the game through DLC packs to add in natural disasters as they happen, like the recent oil spill in the Gulf of Mexico.



Jon Perera, Rob Miles, Scott Davis, Andrew Parsons (from left to right).



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Team Fomis from Mexico, and their game "The Chronicles of Balam." Look at the cute flowers! :3

While competition in Game Design's six teams was indeed tough, Software Design was busily and brutally mashing together 68 separate teams. Competition proved extremely tough during this initial round, and though there were many projects that were fantastic, only twelve could go through to the next stage.

The Armenian team developed *Baby Care*, a remote monitoring system that can be used with sick infants. The Chinese team created a city-wide public transport system called *Palantir*, able to manage buses in an efficient way. *Palantir* can even communicate wirelessly with traffic lights to manage traffic flow, the infrastructure for which would be built into street lamps. The team from Jordan designed a system to monitor the progress of desertification, appropriately named *Oasys*, which communicates the monitored data with satellites in orbit and can predict the rate of change.

Team Khronos from the Philippines takes this monitoring a step further, and their project *L.I.G.T.A.S* was able to coordinate aid efforts in the midst of natural disasters. Both Mexico and Croatia designed remote greenhouse monitoring programs; though all these entries could almost be launched as a real product, only Croatia's project made it through to the second round, alongside eleven others.

Imagine that!

One standout project we noticed that didn't make it through this round was *Imaginote* from Ireland. Logically it should fit into Game Design, though it was instead



The distance from the sound emitter determines the notes heard and visuals played on the screen.

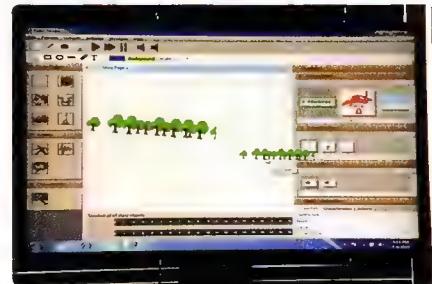
Australian Entry: KidDev Studio

Australia's entry into the Imagine Cup this year was spearheaded by a group of four students from the University of Canberra, who had developed a program they named *KidDev Studio*. They named themselves "Team 1337" in a showing even geekier than most others at the Cup, which is itself essentially a gigantic nerd convention, and presented their entry during the first round in front of a panel of four judges.

The first module of *KidDev Studio* allowed the creation of a simple interactive storybook, using a drag-and-drop interface that was clean and accessible. The second was a reader module that performed keyword replacement for specified phrases, replacing them with images as found via Bing image search to aid in comprehension when read by young students. This module also came with text-to-speech reading and easy to use controls for those with poorer eyesight. As team leader Duc Nguyen extricated, "he just gave an order to the program – you don't even need to touch the keyboard or the mouse or the screen!"

The third module was an interactive quiz that can take advantage of the myriad of interface styles that *KidDev Studio* supports, and an example was posed of a massively multiplayer word-guessing game – using multiple mice plugged into a single system. "There are two main [limitations]: the amount of USB holes and the screen size." On top of this multi-mouse support (up to 25 rodents), there is also support for networked gaming in the pipeline.

Team 1337 did not make it to the semi-finals.



placed into Software. Regardless of categorising headaches, the mechanics are quite simple: a sound emitter and receiver focuses a tight beam of low-frequency noise, monitors when this beam of sound is broken, then determines the distance of the breakage by calculating the time taken for the beam to return. Interaction with *Imaginote* comes as easily as waving a hand through the sound beam, but the result is a visual response from the display in the form of bright colours and shapes, matched with instrumental sounds.

The Irish team are even quite keen to take advantage of Kinect, Microsoft's soon-to-be-released motion detection system for the Xbox 360, which would increase sensitivity of the data available to the program and allow virtual bands with multiple players – think *Guitar Hero*, sans controllers.

ROUND 2: SEMI FINALS

The Cup continued throughout the week, running through the first round quickly and, without missing a step, crashed headlong into the second. 50 judges had cut down the original pool of over 400 Game Design entries before the Cup even began, and of the 137 games that resulted, only six attended the Cup: Belgium, Brazil, France, Mexico, Philippines and Thailand. These were a known quantity before anything had actually begun, but both the Software and Embedded Design categories were up in the air.

We took our place in a cavernous hall within the hard stone walls of the Palace of Culture (right), a room built to hold a huge number of people – but not, it seems, particularly well-equipped for the Imagine Cup's hundreds of

participants. The room was full of brightly lit posterboards that lined the columns within, and a large stage burned with the light from an array of spotlights whose heat, when mixed with the lack of air conditioning and a mass of bodies, quickly made the room as hot, humid and inviting as a software coder's armpit after a particularly challenging incline.

The heated atmosphere extended much further than temperature alone, however, and the sheer energy expended by the competitors as they waited for proceedings to begin gave the air an electrified feel. This crackled between the grinning youths as their patience exhausted itself in a spectacular fashion that resulted in an

emphatic expulsion of this energy, bursting from each soul in the room as a wave of cheers began – completely without prompting, but not the slightest bit out of place.

Microsoft officials eventually took the stage after the enthusiasm calmed itself to a passionate murmur, announcing the twelve Software and ten Embedded teams to move into the next round of selection. While all projects at the Cup were great in their own way, not all could win; and filtering through the projects again had certainly pushed the quality bar even



higher than before.

The projects that didn't make it to the Software semi-finals include the Brazilian team, whose entry *Pro@Edu* made distance learning more engaging; Malta's team and their project *Dice*, an infrastructure for communication between doctor and patient; not to discount Ukraine's software *CoreInvader* that granted paralysed patients the ability to interact with a computer using only the movement of their eyes.



German Entry: Mediator

Semi-finalist entry *Mediator* caught our eye during showcase and presentations, from the eponymously named German team. Their software is a web-based organisational tracking system that works as a middleman between drug companies and aid organisations, in effect 'mediating' the management and implementation of medical supply and demand.

It does so through a website that uses Silverlight for interactive maps and requests, and "tries to increase the coverage of essential medication in those areas... by informing relevant parties with the data they need." In addition to management of access to medicine, those requesting support also receive data about the supplier. "They get information about prices, reliability and sustainability of the local supplier; there are thousands of small [suppliers] that could benefit from *Mediator*."

Not finishing their presentation there, team *Mediator* explained other uses for their solution. "*Mediator* can be used

as a centralised platform for communication in case of disaster: you can use our application with our mobile client, and the data is stored locally. When you get Internet you can synchronise those changes with the service."

Mediator also packs in support for cloud computing service Azure, which would be covered by a subscription fee. "To get the system up and running we predicted we need \$US3700, mainly for staff training costs." Though it did not reach the finals of the Cup, the quality on display is certainly high enough to be launched in the near future and could potentially make a very big impact. After all, as the team explain, "calculations alone don't solve problems – we must give [people] information and help them learn."



Imagine Cup Project Gallery

The Imagine Cup has so many entries that to show them all in detail would take up lots of space, so here are some of the interesting picks that we saw at the show.



1. Croatian team Think Green, with their remotely-managed greenhouse.
2. Russian Embedded project Robonanny, a semi-autonomous bot capable of basic education and minding tasks. Second place in the Finals.
3. OaSys, an Embedded Design entry, which is a desertification monitoring box designed by the team from Jordan.
4. The Senses project and UK Embedded entry, designed to aid the visually impaired. Got through to the Finals.
5. Nigeria and Indwell, an aggregator of teacher-generated content that aims to increase standards of teaching worldwide.
6. Team HDC from Malaysia and Project Apple, a nutrition planner that aims to reduce food wastage. Made it to the Finals.
7. Team TFZR from Serbia, using electroencephalography (EEG) tech to monitor brain waves, giving paralysed patients access to basic independent web browsing and much more. Second place in Finals.
8. Ecuador's classroom app, EASY, can translate from text-to-sign or speech-to-sign.

POLAND: CULTURAL DAY

One theme that was continually broadcasted by all Judges, Mentors and Microsoft employees was that of the focus on competitor experience – not only enjoying the Cup and the technical challenges that it brings, but also having a chance to experience the culture of the host city. To that end the entire Cup was bussed out two hours from Warsaw to the small town of Pultusk, which was first settled during the Middle Ages and known to host a certain short French emperor in one of his battles.

Upon our arrival at the castle, itself mostly destroyed during the Second World War and later rebuilt, we were seated in a courtyard and serenaded with a performance of Polish piano superstar Frédéric François Chopin's most famous symphonies. From here the day opened up into a medieval faire, complete with accordion-wielding gondola singers, traditional cheese making, pottery and dancing. It was then that



Verily, art I not the most period-accurate knight that thou hast ever seen?



I took the chance to don some gear and become a knight – from the waist up – and do battle with others in similar garb.

While some might posit that the cultural day is a distraction from the Cup, we'd argue that it's a well-deserved break for the competitors, giving them a chance to socialise with other like-minded students from all around the world. Most competitors work on their software nightly, and during the day run off adrenaline and sugar – explaining the 8600 Mars and Snickers bars eaten. Even though it was for many the first chance they'd had to experience Polish culture, it seems that every contestant managed to find some form of fun that day.



The chapel ceiling within Castle Pultusk, and a selection of rounded-up competitors.





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END GAME: FINALS

Continuing along the rollercoaster that had been the Cup so far, competitors were cut down to a mere handful of those who began at the start of the week. Each remaining team had barely enough time to practice their presentation until it was etched into the folds of their brain; as Team OneBeep member Vinny Jeet muses, "it's like I've been waking up from sleep and screaming 'OneBeep!'"

Game Design

Third Place: Team Gears Studio, France, 'Green Gears'

Third place in Game Design went to Gears Studio from France and their title, *Green Gears*. It's a 3D shooter that uses three controllable characters: Tommy the soldier, able to destroy



by shooting or mere physical violence; Brain the engineer, able to clean up rubbish with a powerful electromagnet; and an as-yet untitled nurse, who can heal the environment of the pollution that is the focus of the game. Though it is built using XNA like all game entries, *Green Gears* comes with a few tasty extras.

"We had to create the game from nothing, we made the engine from scratch, and we had no experience in games", recounts team member Luc Albert. On top of a custom engine, the team also developed a fully functional level editor that supports instant playtesting. "We wanted to give the opportunity to the community to modify the game. They don't have to be programmers... it's a really good experience."

The team are planning to develop their game further and release it over Xbox Live Arcade soon, with new content and features.



lives and destroyed a significant portion of Philippines infrastructure, was the motivation for the entry into the Cup.

Wildfire involves a single faceless avatar who can recruit adjacent volunteers by using a resource called Inspiration: recruiting sufficient volunteers and taking them to problem areas in the city meets the game's eight objectives, which incidentally line up with the Millennium Development Goals perfectly. Successfully completing these goals improves the 'health' of the city, which is represented in bar form and also in the behaviour of the citizens, becoming more chaotic as the game progresses.

Lead programmer Wilhansen Li ran into a few balancing problems when attempting this part of the game. "The most difficult part is navigating four hundred entities around the city, and animating all of them. I tried to make the calculations simple, but very realistic." The city is also procedurally generated, meaning it will be a different experience every time it is played.

Undertaking the Imagine Cup

Even if you're not known as an official analyser of ridiculously large events, you don't need to delve into data and graphs when talking about the sheer amount of cash that Microsoft must drop on an event like this. They'd booked out an entire hotel, flown hundreds of people internationally, fed and watered them, arranged three different venues then filled them with signage, lights and video cameras, and then organised a day-long cultural experience. Unsurprisingly we couldn't get specific cost figures (nor even roundabout ones), but we could get some insider information out of Walid Abu-Hadba, Corporate Vice President of Developer and Platform Evangelism, about the value of the Cup.

"People don't succeed in this business by having average [workers] – you have to have a really good, qualified labour force," explains Walid. "Students are critical: not just to Microsoft, but to the industry."

The Imagine Cup holds a special place for Walid, who believes it is worthwhile for two reasons. "[Firstly], the experience. Just come and see what other people around the world are doing. It's like the world cup in a lot of ways. The connection with other students around the world is massive. The second reason I would give is future. If you want to know where technology is going, this is the place. This is where we're experimenting." If this weren't enough, Walid jokingly added, "It's just a big party, too."

To give a few numbers, he furthers with, "well over 30 per cent of the projects today are on Windows Phone 7, or use Azure. To put that in perspective, we [haven't even released] Windows Phone 7 yet!"

First Place: Team By Implication, Philippines, 'Wildfire'

Game Design was hotly contested this year, though *Wildfire* was definitely the clear winner. Taking place in a minimalist 3D world, team By Implication found inspiration in a very unlikely place. "The idea that there is a single superhero man who can save the world is fiction." Typhoon Ketsana, which claimed many



Embedded Development

First Place: Team SmarterME, Taiwan, 'SmarterME'

Though there were some fantastic examples of embedded devices on display, the winner of this category was one of the more hotly contested. Winners must be chosen however, and the Taiwanese team gave a smashing performance with their project, *SmarterME*. As an abbreviation of 'smarter meter', SmarterME is a house-wide power monitoring system that can report the power consumption of specific appliances.

This monitoring is incredible in that the system can automatically detect the type of appliance connected to it based on the frequency of the interference generated by the current draw from the socket – and it's able to judge this correctly nine times out of ten. SmarterME can also be scaled up to a business-level monitoring solution, giving data about where the most power is wasted.



Software Design

First Place: Team Skeek, Thailand, 'eyeFeel'

The overall winners and recipients of the Imagine Cup for 2010 were team Skeek from Thailand, and it wasn't only the judges who were blown away by eyeFeel – the audience, fellow competitors, and even we were, too. Best described as a simultaneous real-time speech-to-sign and text language translation engine, eyeFeel requires only a cheap webcam, microphone and basic computer. Intended for use at universities and other learning institutions, the system uses facial recognition

to overlay translation information directly over the speakers as they talk, and is even able to handle multiple speakers at once.

While competing project *Signbook* claimed on-the-fly sign translation was impossible due to processing overheads of sign language analysis, Skeek worked out a solution to this problem. "The part-of-speech tagger tags part of each word in a sentence using the Maximum Entropy Markov Models Algorithm", explained Pichai Sodsai. "We then calculate the most probable part of speech in each word."

Impressively, lectures could be recorded and reviewed at a later date or exported to any device capable of playing video – and as if that wasn't enough, eyeFeel could translate the originally spoken language into other languages

on-the-fly using Bing Translate.

"There are currently 364 million hearing impaired people in the world, and statistics indicate that this will be doubled in fifteen years. By using eyeFeel you can create unlimited learning media for the hearing impaired." Team Skeek estimate it will cost roughly US\$1205 to implement their solution for each student, and plan to remain entirely non-profit.

The aftermath

The finals ended on a high note as all competitors applauded the winners, whose projects will continue to develop over the next few years, though even some teams who did not win expressed their desire to endure. We entered the Imagine Cup slightly sceptical of its actual value, but its positive effects cannot be denied. To relive the excitement of the Cup, you can follow it online at www.atomicmpc.com.au/Topic/220637,microsoft-imagine-cup-2010.aspx

Joining the Cup is easy and can be very rewarding for those who think they have what it takes, and registrations have already opened for 2011. Pichai from team Skeek summarised the show's closing ceremony with a simple, but somehow appropriate message.

"This is the moment of our lives. Like all of you guys, we don't wait for the future. We create the future, and we change the world."

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with easy options for double whoa! It's everything you'll ever need to know, but – yes, we're going the cliche – were afraid to ask.

There's also a treasure-trove of reviewy magic for you to enjoy; from motherboards to video cards to speakers to storage, all topped off with a trifecta of cases, there's bound to be something to take your fancy. If you like that kind of thing...

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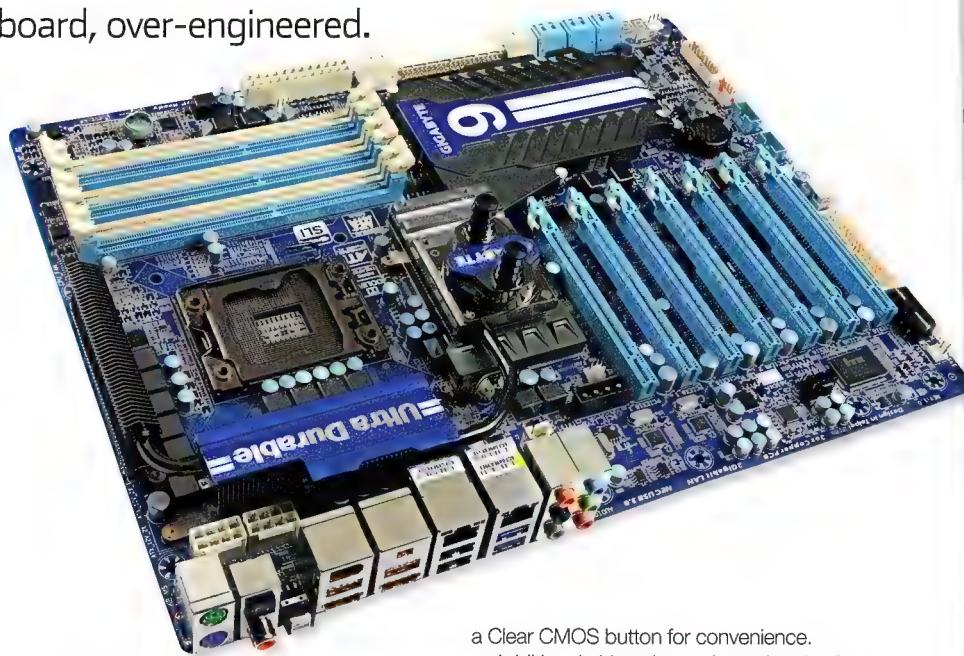
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Gallery www.atomicmpc.com.au/?172001

Put the magazine down on a flat surface for a minute. Look at the motherboard that lies on this very page. Take a good, long look at its form; how the seven PCIe slots lie one after another in perfect symmetry, how the immense XL-ATX size appears to be normal, fuzzed by the sheer density of components that pepper its surface. How, even through the chaos, it can still appear to have a form of order. Now, once you've peered at the board a spell, drift your gaze towards the price.

Oh. Wow. I really – six hundred!?

So, let's take a quick look at what this board actually entails. Starting at the Intel X58 Northbridge chipset, a mainstay of the enthusiast, there are two NVIDIA NF200 chipsets, themselves located adjacent to the ICH10R Southbridge. In totality the X58 offers 36 usable PCIe lanes, which the two NF200 chipsets multiply for a combined total of 72. These 72 lanes are pumped directly into seven full-length PCIe slots, four of which are electrically 16x, and all enough to power anything needed in the graphics department, however demanding. They can support either Crossfire or SLI, and there's just enough space for four dual-slot cards to be installed at any one time. The form factor does mean that the lowest, seventh PCIe slot actually



resides in eighth place when compared to a standard ATX board, and very few cases are compatible (though the Haf X on page 43 can manage the bulk).

Storage options are similarly boosted, and joining the ICH10R Southbridge's six SATA2 ports are five chips: the 'GIGABYTE SATA2 chip', for two SATA2 ports and one IDE; a JMicron JMB362 chip, for two eSATA ports that reside on the rear I/O panel; an iTE IT8720, for antiquated floppy support; the Marvell 9128, for two SATA3 ports; and finally the NEC D720200F1 chip, granting two USB3. The rear panel also includes

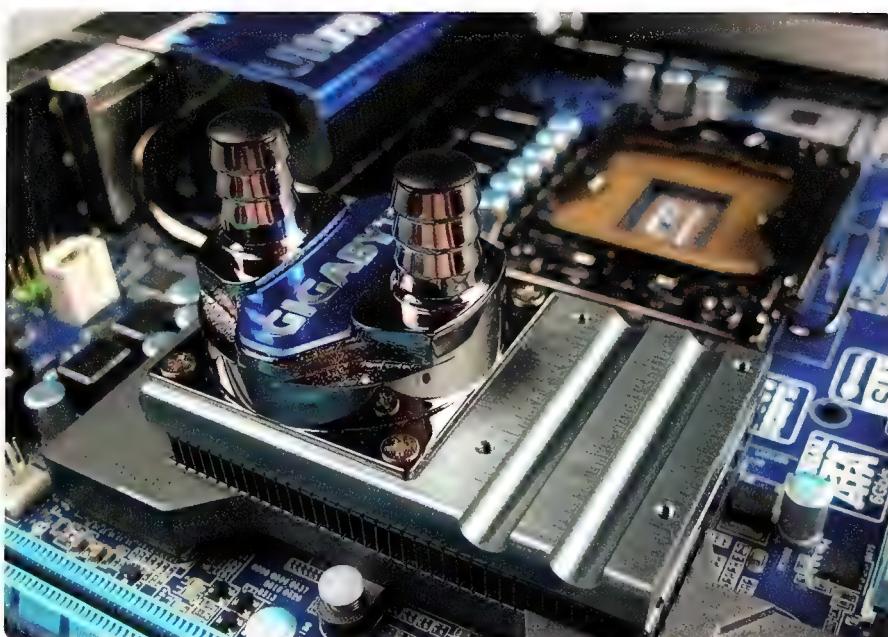
a Clear CMOS button for convenience.

Additional chips also make a showing in the form of a T.I. TSB43AB23 FireWire controller, a decent Realtek ALC889 audio chip (though nothing special) and two additional Realtek RTL8111E Gigabit Ethernet ports that support teaming.

Even if that had started to sound like an awful lot, the engineers just kept on adding more and more features into this already packed board – hard power/reset switches make a showing in addition to a LED POST screen, six fan headers are located in convenient positions around the board, twelve packet switch chips squeeze between slots for redirection of PCIe lanes (and two molex connectors to provide stability when using them all), with an excessive 24-phase power delivery system built around the LGA1366 socket – able to deliver a PSU-blowing 1500W. Thankfully you'll never be able to draw that much. Ever.

These phases are rather cleverly designed, and rather than all running at once, only twelve are activated upon boot-up in an alternating fashion. This means that each set of twelve phases are theoretically worn down one at a time, and if one fails there will be a spare set to keep things ticking.

Cooling all this is an impressively large display of copper and aluminium heatsinkery that struggles even at idle, sitting at a toasty 65 degrees. The addition of the included cooling tower that bolts above the Northbridge sooths temperatures to 59, but these components still generate a huge amount of heat that make their daily use somewhat impractical. They also affect boot-up times – with all additional chips enabled it took 27 seconds to even POST! During this period we were left quizzically puzzling about whether or not the board was





functional, though thankfully when disabling the unused extraneous components POST times reduced to a few seconds.

At stock settings we see performance identical to other high-end X58 boards on the market, such as the Rampage III Extreme or UD7, and our mild overclocks don't show a huge advantage either. Overclocking further is an interesting experience, as the BIOS seemed quite precisely tuned; though it offered little help with automatic voltage settings. Voltages could be keyed in directly with enough granularity to get fine control over settings, but vDroop reared its ugly head in real-world use as 1.46875V set in and the BIOS fell to 1.392V. Interestingly the opposite occurred when using higher voltages, as the board became over-enthused, though

It's clear from the outset that this board is not going to be appropriate for a budget build. It's also clear that it's not suitable for a HTPC, for an office rig or for a LAN build. At no time will this board ever make sense for anything even remotely close to a real-world situation – even extreme gaming doesn't require a board

group of extreme cooling fanatics, fewer still make the leap to liquid nitrogen cooling. Liquid nitrogen, or LN2, demands the purchase of copper pots and the hiring of actual LN2 canisters, and it is not something that most do in their spare time. In the entire country we could probably list four people who actually do it regularly for yucks – and one of them is actually a GIGABYTE employee.

That places the UD9 squarely between a rock and a very, very hard place. Technically this is the most advanced motherboard that we've ever had the pleasure of playing with, one that offers so many enthusiast features in a single package that to use them all in one sitting is almost enough to induce rapture. Realistically, this board is a hard sell, and though a few people in the world will surely get every cent from this board at the extreme end, it just doesn't make sense for 99.9 per cent of users.

If you've got the cash to drop and the willingness to pair it with the highest-end gear however, this is the only board to buy. 

At no time will this board ever make sense for anything even remotely close to a real-world situation – even extreme gaming...

not to the same extent as before. Ours also had a funny problem with BCLK speeds over 165MHz, not repeated with a multiplier increase suggesting motherboard troubles.

In a way it's almost harder to get a nice overclock out of this board – the heat, peculiar BIOS and odd quirks such as USB keyboard support being disabled by default all merge together to push that difficulty bar further away from the reach of the average user. We failed to generate an exceptionally noteworthy overclock under our standardised testing.

anywhere near this level. This is a board that, though it does support watercooling with a built-in chipset block, really demands subzero cooling to reach its full potential. And therein lies its biggest hurdle.

Of all Atomic's readers, there are perhaps a few thousand who would consider running watercooling in a day-to-day setting. Of those who actually do go to the effort to get wet, there are a few hundred who would consider phase-change (a noisy and expensive way of chilling a processor). Of that very, very small

GIGABYTE X58A-UD9

	1975 133x25; DDR3-1600 8-8-8-24; 3.33GHz	150x25; DDR3 1500 8-8-8-24; 3.75GHz	160x25; DDR3-1604 8-8-8-24; 4.00GHz
PiFast	25.29s	21.81s	20.53s
wPrime 32M – single thread	37.581s	33.244s	31.371s
wPrime 32M – multi-thread	7.737s (4.86x efficiency)	6.724s (4.94x)	6.334s (4.95x)
CineBench R10 64-bit – single thread	4996	5685	6073
CineBench R10 64-bit – multi-thread	19792 (3.96x efficiency)	21980 (3.87x)	23655 (3.90x)
Everest Read	16771MB/s	15682MB/s	16515MB/s
Everest Write	14065MB/s	13558MB/s	14456MB/s
Everest Latency	41.9ns	43.5ns	40.7ns



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PALIT GTX470

A more palatable version of this card than we've seen before.

Street Price \$500 **Supplier** Palit

Website www.palit.biz/en

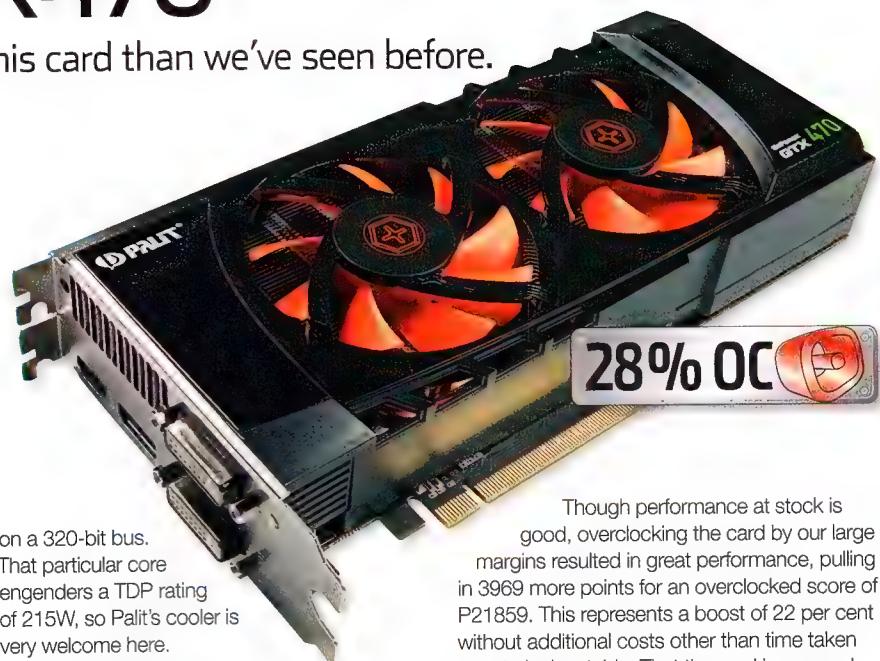
Specifications 608MHz core; 837MHz memory (3448MHz effective); 1215MHz shader; GF100 'Fermi' core; 448 CUDA Cores; 1.28GB GDDR5; 320-bit memory interface; dual slot PCB with active cooling; dual 6-pin power connector

Card info www.techpowerup.com/gpu/z/kbn9a/

The GTX470 seems to be the perfect card for many manufacturers: the TDP is within realistic limits for aftermarket cooling, the core is generally pliable enough to eke out a factory overclock, the PCB and power delivery system can be tweaked for a more cost-effective design and more importantly – there actually seems to be a decent volume of cores for them. This brings us to Palit's offering of the GTX470, and while it has all the things listed above save a factory overclock, it still has a lot of challenges to overcome.

Firstly and most importantly, Palit has custom-designed the PCB and cooling system to great effect. Though the heatsink is a relatively standard affair (take a lump of copper, throw in a few heatpipes and whack some aluminium fins in there), its two fans do a much better job of cooling the card evenly along its length, and also keeping the power regulation under control. It looks visually interesting enough, but the performance of the cooler is great – idling at 40 degrees with an impressive load of 78. Palit's design is ten degrees cooler at load than the reference GTX470 design, though it generates 59.0dBA while idling and 65.6dBA at load. This is similar to the reference design, but as it's cooler, it's also better.

This is made even more impressive by the specifications of the GF100 'Fermi' core Palit has chosen to run inside the card, boasting 448 CUDA Cores and 1280MB of GDDR5



on a 320-bit bus. That particular core engenders a TDP rating of 215W, so Palit's cooler is very welcome here.

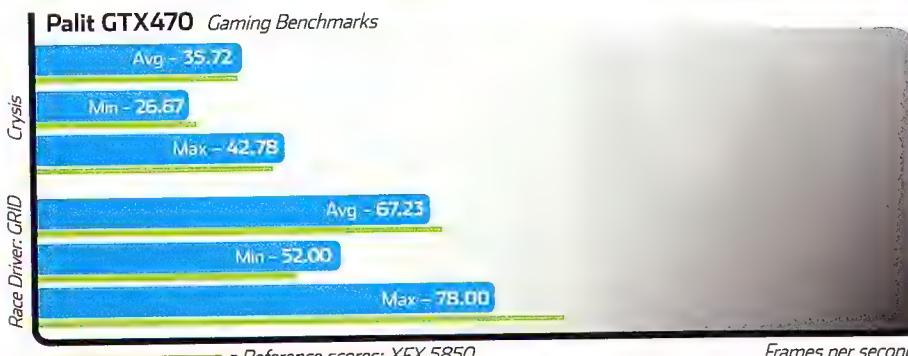
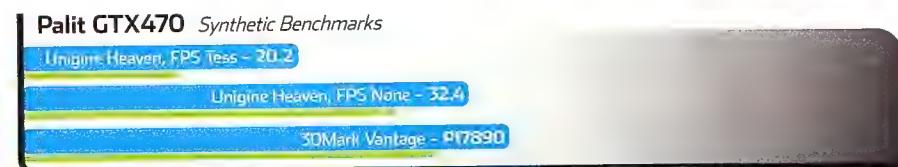
The enhanced cooling also lends a helping hand when overclocking, and unlike the Galaxy GTX470 GC from last issue, the Palit card's core increased by a whopping 28 per cent to 781MHz (+173). We could also increase the memory clocks by five per cent (+44), though this was not particularly breathtaking.

Performance in games was solid, pulling playable average frames in Crysis with a flawless showing in GRID. The GTX470 should be more than enough to play most games at decent settings for the foreseeable future. Unigine shows good scores with tessellation enabled as per NVIDIA's tessellation-optimised architecture, though the gap between it and a 5850 closes when tessellation is not used. 3DMark Vantage pulls a nice P17890 score, though this is inflated somewhat by PhysX.

Though performance at stock is good, overclocking the card by our large margins resulted in great performance, pulling in 3969 more points for an overclocked score of P21859. This represents a boost of 22 per cent without additional costs other than time taken to get clocks stable. That the card is so good at overclocking is interesting; but even more so is why Palit didn't overclock it from the factory. Amusingly the packaging claims that a game is included, but this is simply the free 'Supersonic Sled' demo available from NVIDIA.

Irrespective of these decisions the card commands the nauseatingly high price point of all GTX470 cards, running in at a cost of \$500. Unless technologies like PhysX and CUDA are specifically needed this is quite a lot to pay, especially when a 5850 or 5870 would do the same or better for less money. Tessellation isn't really a consideration at this stage in the hardware game; support is important, but integration into game titles at this time is limited.

Ultimately this card takes the disappointing GTX470 design and improves it – but shows that there's only so much that can be changed. 



GIGABYTE GTX 460 1GB OC

Redemption in 1.95 billion transistors.

Street Price \$300 Supplier GIGABYTE

Website www.gigabyte.com

Specifications 715MHz core; 900MHz memory; 1430MHz shader; GF104 'Fermi' core; 336 CUDA Cores; 1GB GDDR5; 256-bit memory interface; dual-slot PCB with active cooling
Card info www.techpowerup.com/gpuz/97dr

Until now NVIDIA's Fermi architecture has struggled against the competition. The GeForce GTX 480 was hotter, louder, a tad slower and much more expensive than ATI's Radeon 5850. This is largely due to the silicon behemoth that is the three billion transistor GF100 chip used on the 480, 470 and 465 cards.

NVIDIA has ducked a lot of these problems with the GeForce GTX 460. This uses a different chip to the GF100, codenamed GF104, which has 1.95 billion transistors. It still uses the same Fermi architecture as previous cards, but has less CUDA cores and hence takes up less space and uses significantly less power than the high end cards. This design results in the card drawing only 160 Watts, as compared to the 250 Watts the GTX 480 pulls in. As such, the GeForce GTX 460 requires two six pin power connectors to run, and NVIDIA recommends a minimum power supply of 450 Watts.

There are two flavours of GTX 460 cards at the moment; both have the same GPU specs but differ in the memory department. They have 336 CUDA cores and run with a graphics clock of 675Mhz. The higher end model uses 1GB of GDDR5 running on a 256-bit memory bus, while the cheaper model has 768MB GDDR5 running on a 192-bit memory bus.

If you look at the technical specs given by NVIDIA it appears that the only difference between the two models is the memory bus and capacity. However, due to the way in which NVIDIA designs its chips, stepping down in memory size involves disabling memory



controllers in the GPU. As a side effect, this means that when memory controllers are disabled then several Raster Operations Processors (ROPs) are disabled as well. As

performance, while the GTX 465 is a GTX 480 chip with all the faulty bits locked off. The GTX 465 is such an embarrassingly anomalous product that on the day it launched NVIDIA's CEO addressed the world's media and didn't even mention it. On the other hand the GTX 460 is a GPU that NVIDIA has been proudly crowing about since day one.

This difference is apparent when both cards

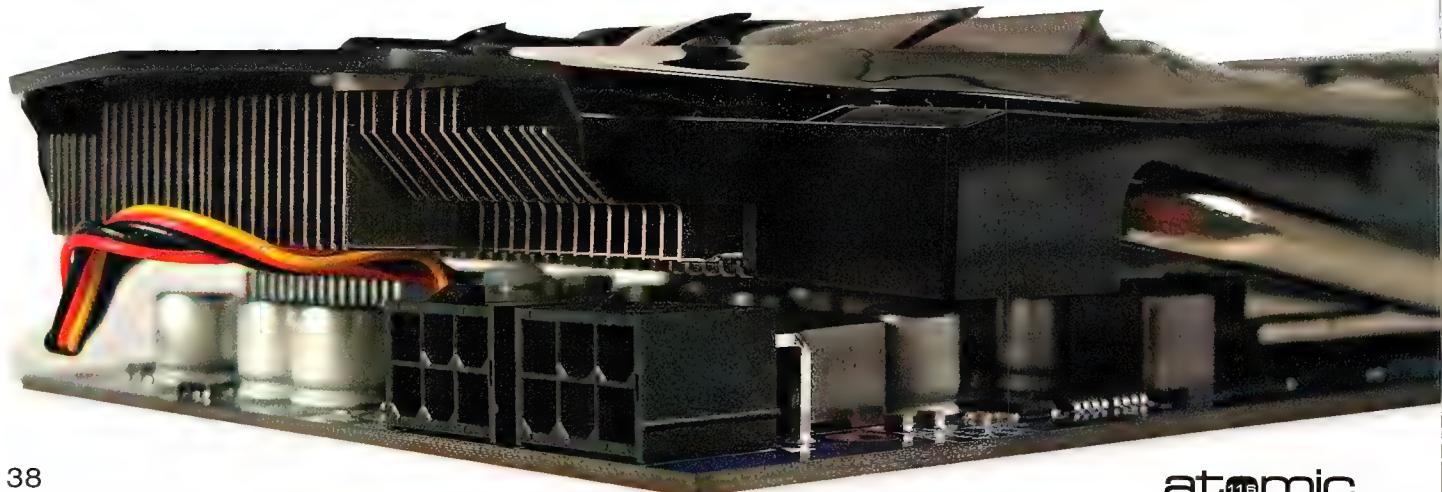
On paper this puts the GTX 460 a little behind the recently released GTX 465. But as always the specs obfuscate the real differences...

ROPs control the final stage of image rendering this actually means that the 768MB cards will have less post processing performance than the 1GB version.

On paper this puts the GTX 460 a little behind the recently released GTX 465. But as always the specs obfuscate the real differences between the cards. Namely that the GTX 460 is designed at a Silicon level to deliver mainstream

have their temperature taken. The GTX 465 idles at 37 and runs under load at 77 degrees. This is a step down from the GTX 480's ability to heat a small nation, but is still significantly more than the GTX 460 which idles at 27 degrees and only hit 64 degrees under load.

Not only is this the coolest Fermi card, it is also the quietest. The dual fan WindForce 2 cooler on GIGABYTE's GTX 460 1GB OC helped





the card idle at 46DBa and ramp up to a barely noticeable 52.6DBa. It is also worth noting that even when we overclocked the GPU and loaded it down with Kombuster the fans barely broke 50% speed, indicating that not only has NVIDIA come up with a cool chip, GIGABYTE has paired it with a highly efficient cooler.

Overclocking performance was solid, with the GPU running stable at 805MHz, 13% faster than the factory overclocked speed of 715MHz (the stock GTX 460 runs at 675MHz). The RAM runs at the reference 1800MHz, which still ran stable after a 25% boost to 2250MHz.

Given the meh-worthy performance of the rest of the Fermi family, one could extrapolate that such a massive drop in heat and noise would equate to woeful performance. Surprisingly enough this isn't the case – not only does the GTX 460 hold its own in the benchmarks, it gives both the GTX 465 and the competing Radeon 5830 a good kicking along the way and ends up nipping at the heels of the Radeon 5850.

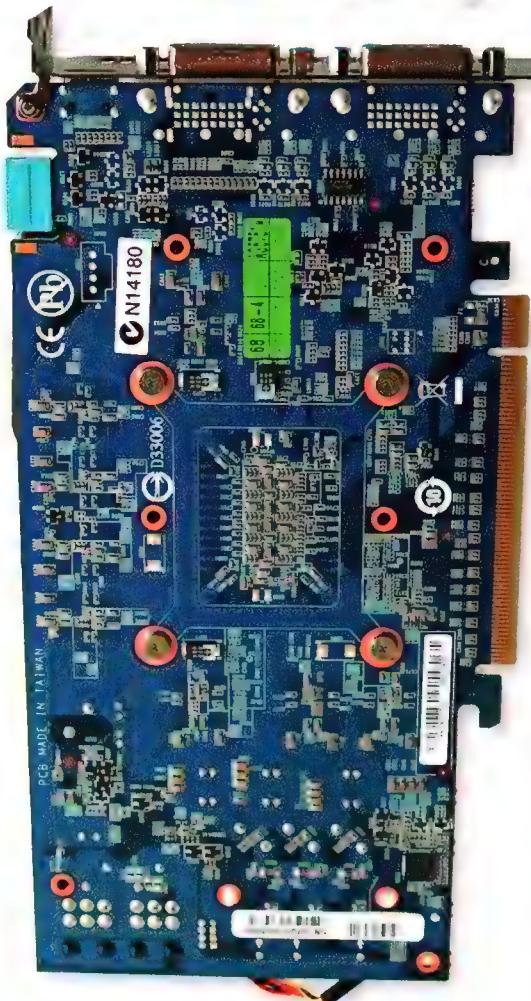
In Crysis it performs on the right side of playable delivering just over 30fps, jumping to 33.6fps when the card is overclocked. It averages 56 frames in GRID, with a noticeable jump to 64fps when overclocked. This trend continues with 3DMark Vantage where the GTX 460 scores P16198 and jumps to P18004 when the speeds are ramped up.

It's in tessellation performance that the GTX 460 really shines, which is also one of the few areas where the GTX 480 really stands out. When tessellation is set to extreme it is a better performer than the reference 5850 and the GTX

465, achieving 17.3fps (19.7fps overclocked). With tessellation turned off it delivers a score that is competitive with the 5850.

Until now tessellation, like PhysX, has been a secondary concern thanks to the huge price gulf between ATI and NVIDIA products. But with the GTX 460 finally making NVIDIA price-competitive with ATI it brings these extra features to the forefront. PhysX will never be an integral part of gameplay while there is only one GPU vendor accelerating it, but it does add an extra degree of eye candy to supporting games. Similarly the inherent lag between hardware features and software implementation may limit the amount of tessellation we see in the near future, but if and when it does start becoming a part of PC gaming then the GTX 460 will cope a lot better than ATI's architecture will.

After bombarding us with such underwhelming products it is nice to see NVIDIA finally get Fermi right. The GeForce GTX 460 is still definitely a mainstream part, but it gives the best DirectX 11 price/performance to date. In the case of GIGABYTE's GTX 460 1GB OC version you get a card that comes pre-overclocked to give you a bit of a boost over standard designs, while also getting extra overclocking headroom. Add to this a fan that makes hardly any noise and you have something that only a few months ago seemed highly unlikely: a Fermi-based card that performs well, runs cool and barely makes a sound. It is just a pity that NVIDIA had to wait until its mainstream product line to get all three right. 



Gigabyte GTX 460 1GB OC Synthetic Benchmarks

Unigine Heaven, FPS Tess - 17.3

Unigine Heaven, FPS None - 30.8

3DMark Vantage - P16198

Score

Gigabyte GTX 460 1GB OC Gaming Benchmarks

Avg - 30.59

Min - 25.32

Max - 35.72

Avg - 56.00

Min - 41.00

Max - 74.00

Frames per second

Crysis
Race Driver: GRID

= Reference scores: XFX 5850

Performance
Surprisingly high for a Fermi-based card.

90

Bundle
Basic power cables and driver CD.

70

Value
The best price/performance card.

90

Build
Silent and cool.

94

Overall
If you've got \$300, you've got no other choice.

92%

SAPPHIRE 5970 TOXIC

When sweet excess just isn't enough.

Street Price \$1550 **Supplier** Sapphire

Website www.sapphiretech.com

Specifications 900MHz core; 1200MHz memory (4800 effective); 2x RV870 'Hemlock XT' core; 3200 shader units; 4GB GDDR5; 256-bit memory interface; triple slot PCB with active cooling; dual 8-pin PCIe power connector required

There's always going to be someone out there who's going to want the best. They're gonna roar down the street through a school zone in their million-dollar car, blasting out some new-fangled hip hop beats from their sound system that sounds better than real life ever could, and they're exactly the type of people who this card is aimed at – those who accept nothing less than top performance. Does that mean this is the perfect card for all? Well, perhaps not.

Specifications for such a card are certainly amongst the most impressive we've seen yet, packing two fully-fledged RV870 cores underneath its hulking frame. These cores contain the highest processor count of the entire 5xxx family, and combined they provide a total of 3200 shader units that work in unison, each synchronised at a core clock of 900MHz. This is a significant boost on standard 5970 clocks, which usually run at a meagre 725MHz, and is an impressive factory-guaranteed speed. Coupled to each core is a 256-bit wide memory bus that interfaces with 2GB of the fastest GDDR5, clocked at a memory speed of 1200MHz for an effective 4800MHz.

Some might say that as each core has access to two whole gigabytes of memory that the card's total is four; well, that's not entirely true. The card's construction is such that it's best pictured as two separate cards that just happen to be located on the one piece of silicon, and



the nature of graphical work means that the memory data is duplicated between the cards as they perform their duties – not quite four, but two is still more than enough.

An expected by-product of two overclocked cards sharing the same space is one of heat and power consumption – the Toxic demands two 8-pin PCIe 150W power connectors to provide a phenomenal amount of power to the two cores, in addition to the 75W available to it through the PCIe slot. Heat pours out of the card under load. Not quite enough to make the card unstable, though it noticeably affected other system components such as the DDR3 memory and processor heatsink. High airflow is certainly needed to remove this excess heat leakage.

There is an impressive cooler applied to the card, which consists of two copper plates and five heatpipes, and an entanglement of aluminium fins, boasting three 92mm frameless

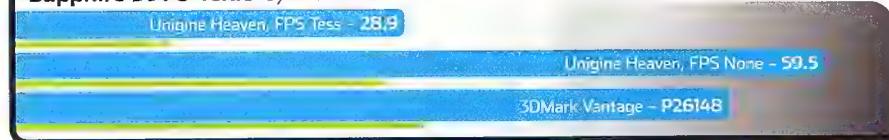
fans. While heat measurement and overclocking was impossible due to time constraints, the nature of this design means that it struggles to force enough air through the tightly-spaced fins at lower revolutions, forcing the fans to spin faster and generate more noise. The Toxic is certainly audible above any background din.

Performance is astounding, though, and the two overclocked cores return some of the fastest scores we've seen in testing yet. 3DMark Vantage is boosted by roughly 4000 points compared to a reference 5970, while Unigine burns through other cards to give an almost-playable experience under Extreme tessellation – typically unheard of for a single card. Interestingly we ran into a slight driver headache when attempting to run GRID at any resolution over 1280x1024; a setting not worth testing at with frames generated in the hundreds.

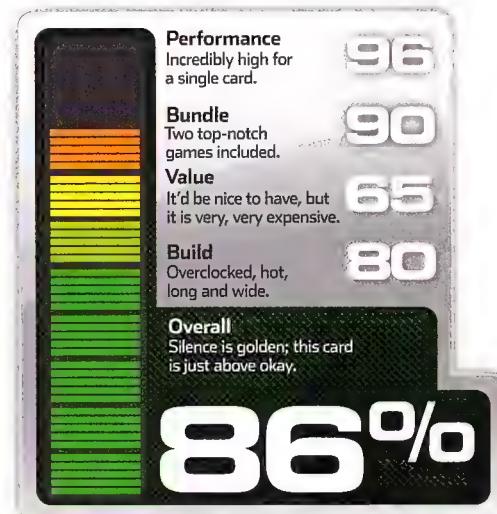
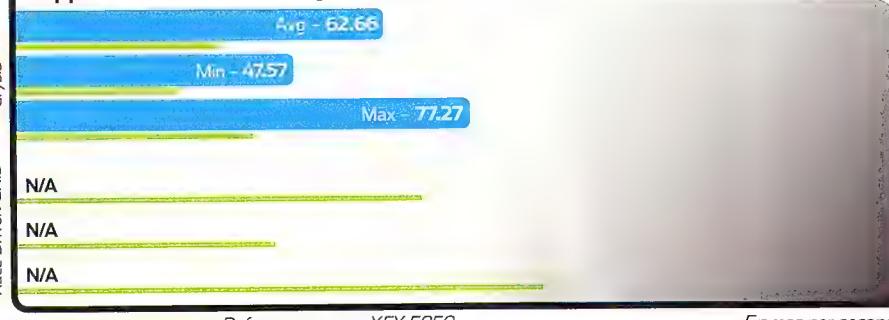
And yes, it can run Crysis.

There's even copies of Modern Warfare 2 and Dirt 2 thrown in to sweeten the already tempting deal, though you'll cringe once you see the price – almost as much as an entire system would cost. You'll pay for the fastest, but in this case, we're almost tempted to suggest an alternative instead.  JR/JG

Sapphire 5970 Toxic Synthetic Benchmarks



Sapphire 5970 Toxic Gaming Benchmarks



Logitech Z313

Aural fast food.

Street Price \$75 **Supplier** Logitech
Website www.logitech.com.au

Specifications 2.1channels; 25W RMS; 48-20,000Hz
 freq response; 3.5mm audio input

Speakers are often one of the components that are an afterthought; usually decided upon at the end of a build when cash reserves might be dwindling. The market for cheap sound is a large one, and the Logitech Z313 speakers sit smack-bang in the middle of it with a price tag of \$75. That cash will net you an inoffensively small subwoofer with two decent-looking satellites, and a control pod that offers volume control and a power switch.

Set-up is simple enough that an infant could configure them if left long enough, requiring only power and a 3.5mm audio source. Annoyingly the cables are quite short at just under two metres for all distances, restricting the Z313 to use in smaller desks. Setting up the sub underneath a desk, with two satellites up top, we set about listening to *Set Me on Fire* by Pendulum on CD.

Due to the nature of the incredibly small speakers in the satellites the higher frequencies came out quite clearly, though the subwoofer

struggled to keep up with lively low-frequency beat, muddying up the mid-range in the process. It didn't sound bad, but it didn't sound particularly great, either – just recognisable as the song. Interestingly the sound became much clearer and enjoyable at the highest volume, though it wavered markedly as the tiny 25W RMS rating struggled to produce consistently loud noise.

The Z313's are less impressive in *Modern Warfare 2*, giving no sense of situational awareness and a detached feeling that made the action seem far away, a problem intensified by tinny-sounding gunshots and grenade blasts that lacked punch. They're more than enough to play the game, but not enough to get right into the action.

In a way these speakers are like a cheap cheeseburger: they'll give you noise that is somewhat appealing at first for a nice price, but once you're finished listening you may not want to go back for a second bite.  JR



OCZ Vertex 2 100GB

The fastest SATA2 SSD on the block.

Street Price \$500 **Supplier** OCZ
Website www.ocztechnology.com

Specifications 100GB (93.16 formatted); SandForce controller; SATA2 interface; 2.5" form factor

The SSD market is more hotly contested than a bunch of starving plane-crash survivors squabbling over the last can of beans. With so many manufacturers stepping into the fray, and all of them offering what is essentially an aluminium wedge of flash chips with a controller, it's hard to determine exactly which product is good, which is bad – and which to steer clear of.

There is one company that appears to have done the legwork on SSDs thus far however, and OCZ has had a near-perfect record with solid state tech (their PCIe-based offering m84 notwithstanding). The Vertex was a great example of this, and it's been thrown back to the engineers for some tweaking: just add in a SandForce controller to replace that dusty Indilinx, cram 100GB's worth of decent multi-level cell flash chips in (with 7GB reserved by the controller for error correction) and sell it for five hundred bucks.

Performance is the best we've seen yet; returning sustained reads of 230.5MB/s, bursts of 249.9MB/s and access speeds of 0.1ms – though this is only marginally higher than the MX-DS 100GB drive seen in Issue 114.

When full of junk data the drive returned slower averages of 201.4MB/s and bursts slightly higher at 257.4, so aim to keep some free space for top performance. OCZ also throws in a convenient 2.5in to 3.5in adapter, and the drive's controller supports TRIM.

It's surprisingly snappy to use, with 2GB of small files copying in just over thirteen seconds, and the three-year warranty is a nice touch. While it is possible to grab the aforementioned MX-DS SSD for slightly cheaper than the Vertex 2, an extra year's warranty and small performance increases do provide a tempting choice.  JR



Coolermaster HAF X

Coolermaster outdoes even itself in the realms of serious cooling.



Street Price \$365 **Supplier** Coolermaster
Website www.coolermaster.com.au

Specifications 230 x 550 x 599mm (D x W x H); 14.35kg; 9x expansion slots; 6x 5.25in drive bays, 5x 3.5in drive bays, 2x 2.5in drive bays (converted); 1x 230mm fan (front), 1x 200mm fan (side), 1x 200mm fan (top), 1x 140mm fan (rear); 2x USB 3.0, 2x USB 2.0, 1x eSATA, 1x Audio, 1x Mic; m-ATX, ATX and e-ATX; steel and plastic

Atomic's had bit of a love affair with the HAF cases. Both the 932 and 922 models that we've reviewed previously have been Hot Award winners, and the 922 even has the dubious honour of housing the Editor's own system. The HAF series – or High Air Flow – features bold military styling combined with serious cooling power. The new HAF X, first unveiled at CES, is now in our labs. Does it continue to hold sway over our hardware hearts?

Well, we could just say "Yes!" and fill the page with pictures of us hugging the case, and scrawls of love hearts containing the words "Atomic 4 HAF". But that's hardly professional. And it's not as if there's nothing to write about...

Like its illustrious forebears, the HAF X features a ruggedised-style case design; all hard edges, ridged metal and mesh inserts. The powder-coated metal surface is great for handling, too, as it really doesn't pick up finger prints at all. The front fascia features a large mesh insert on the bottom half to protect the front fan, and slot guards for the external drive bays. And it's all filtered, too, to make that your High Air Flow doesn't become a Serious Dust Storm.

The power and IO options also show a lot of thought. There's everything you'd expect up here, and a couple of surprises – namely, two USB 3.0 ports and a sliding port to cover the power and

reset buttons. It's great seeing USB 3.0 filtering into case design now, but the implementation is still clumsy – you'll need to run cables from the front of the case, out the back and into the back of a compatible mobo. But sadly that's the only way to play until mobo vendors fix the issue. On the upside, Coolermaster has promised to help HAF X owners out by supplying them with whatever fix is needed – so keep your receipts.

The rest of the top panel houses a mesh insert protecting a single 200mm fan.

The main sidepanel boasts another fan, this time a 230mm model that's focused right onto your video card array by a neat plastic shroud. At the case's rear the nine expansion brackets are all meshed to increase airflow, and wherever possible there are more slots and mesh plates to help exhaust hot air. The other sidepanel has an extruded surface to increase the cable space behind the motherboard plate; this adds strength to the panel, and the entire case is extremely sturdy.

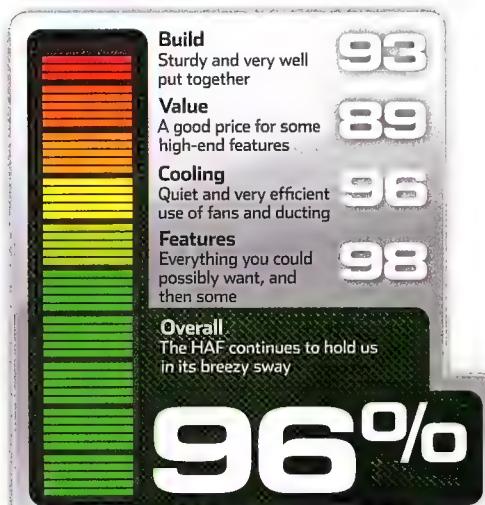
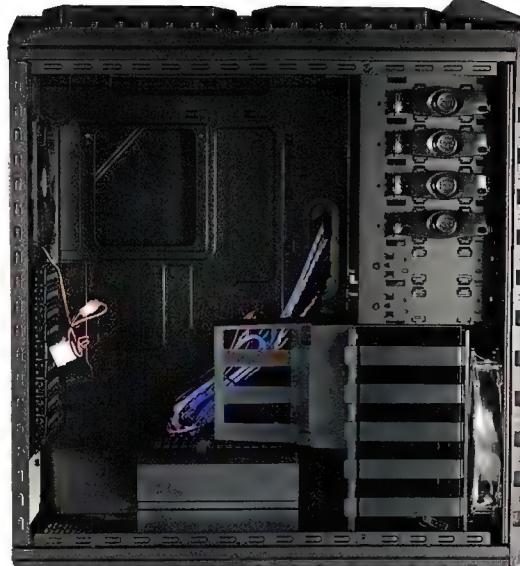
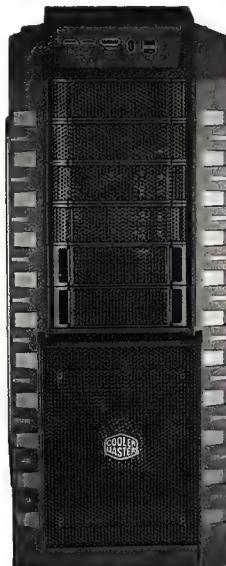
The interior continues to please, all clad in sexy black. The expansion sockets are all secure by thumbscrews, which is a nice touch. Yes, tool-less can be cool, but screws are still the most secure method of keeping big video cards beasts from rattling around. The mobo plate is roomy, with great cable management options. In addition to the shroud on the side-panel fan, there's also one that sits over your video cards, and another over the PSU. These really direct and focus airflow, making this arguably the best of the HAF models we've yet seen.

The 5.25in drive bays are the only real weak spot. Coolermaster's push-button tool-less



implementation is super-finicky – we even had one of the little push-button units explode in a shower of springs and soon to be lost parts! But they're easy enough to remove, so falling back on traditional screws is not an issue. There's even a bracket for an SSD in one of the 3.5in bays – a very welcome touch – and two front caddies that slide out to reveal hot-swap mounts for HDDs.

This is a luxurious case for any grade of user, but if you're going to build a hot machine packed with overclocked CPU and up to a quad SLI/Crossfire setup, it's just about perfect. DH



NZXT Tempest Evo

A budget case offering with pretensions of grandeur – does it deliver?

Street Price \$145 **Supplier** Australia IT

Website www.australiait.com.au

Specifications 211.5 x 521.5 x 562 mm (W x D x H); 11.2kg; 7x expansion slots; 3x 5.25in drive bays, 1x external 3.5in drive bay, 8x internal 3.5in drive bays; 2x 12mm fans (front), 2x 140mm fans (top), 1x 120mm fan (side), 1x 120mm fan (rear); E-ATX, ATX, M-ATX; steel and plastic.

NZXT is never going to be a great case-maker, but we suspect that's not the company's plan. Rather, NZXT excels at delivering cheap and cheerful cases with a range of high-end features, but with enough cut corners to keep the price down. So what corners are cut, and is the efficiency of the case compromised?

The NZXT Tempest Evo is aimed squarely at gamers who want a flashy and powerful system. Aggressive angling on the front and top fascias highlights this design ethos, and is only enhanced by LED lights running the full length of either side of the front panel, and blue LED fans on the front and side panels. Given this "Look me, I'm a gaming system!" attitude, it's odd then that the side-panel is tinted. So, it's more of a "Look at me, but not too close." kind of feel.

The Tempest Evo features the usual IO options: two USB 2.0 ports as well as audio and eSATA.

In terms of build and construction, the NZXT has very little surprises, and very little to excite. The plastic front fascia will not be to everyone's liking, and the plastic thumb screws that secure the side panels will be even less so. The tinted window, too, is pretty cheap plastic, though it's nice to see a sturdy metal mesh over the fan intake. There's a similar mesh on the top of the case to protect the two fans there, and a finer plastic mesh on the case's front to keep pesky

dust and other crap out of the delicate interior.

With the side panel off, however, things do look up a little. The interior is nicely anodised black metal all over, with an interesting mix of toolled and tool-less design options. The front of the case is the most interesting area, with a total of nine 5.25in bays, six of which are taken up by two caddies that each house four 3.5in drive bays. The free 5.25in bays are tool-less, but rather loose, while the HDD caddies feature a slide-in, slide-out mechanism to make swapping drives relatively painless. Again, it's not the most secure mechanism, so if you're planning on LANing with this case, adding a single screw to each drive is going to be a good idea.

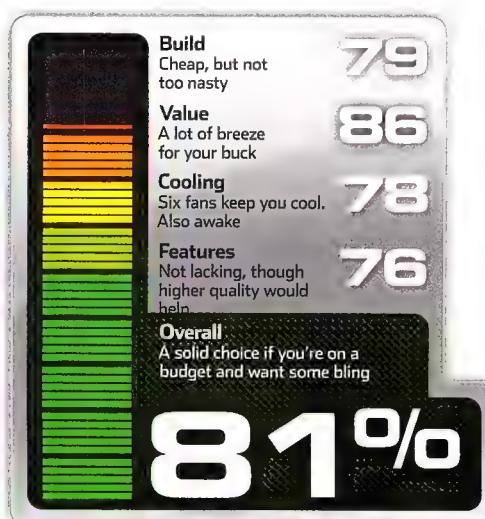
The rest of the interior is solid, if uninspired. The PSU rests on four rubber nodules, which is good for keeping things quiet, but this is offset by the fans, which generate a lot of noise. The case itself isn't an acoustic wonder, either. Unless you game or compute while wearing headphones, you'll be very aware whenever you turn any system housed in the Tempest Evo.

The motherboard tray is relatively roomy, and features a CPU cutout and a nod to cable-management in the shape of two rubber coated cable cutouts. In reality, though, the rubber grommets here tend to pull out easily, and there isn't quite enough room to deal with every last length of cable. Speaking of cables, though, this new iteration of the Tempest at least features black IO case connectors.



If you're really insane, you can even strip out the top fans in favour of a radiator for a liquid cooling setup, but if you're going that far down the dark path of enthusiast computing, you should really be able to afford a more appropriate case.

For the low price, and the amount of cooling (albeit noisy) you get, the NZXT Tempest Evo is a pretty solid buy. Yes, there are some touches that don't really endear it to us, but if you're looking for a bold, well-lit case to house a hot-running gaming system, there are worse choices you could make.  DH





XFX

play hard.

www.XFXforce.com

POWER HUNGRY?

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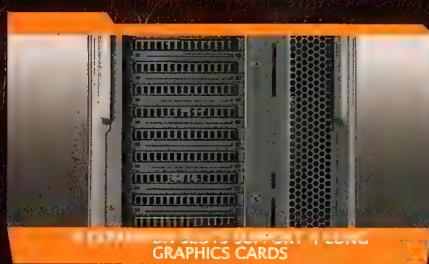
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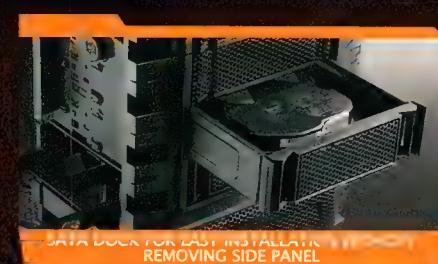
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Lian Li PC-A77F

Lian Li delivers another great case, but the asking price is a touch on the steep side

Street Price \$470 **Supplier** Mittoni

Website <http://lian-li.com>

Specifications 220 x 572 x 590mm (W x H x D); 9.15kg; 12x 5.25in drive bays, 9x 3.5in drive bays (using six 5.25in bays); 8x expansion slots; 3x 120mm fan (front), 2x 120mm fan (top), 1x 120mm fan (rear); 4x USB3.0, 1x e-SATA, 1x HD Audio ports (top front); E-ATX, ATX, M-ATX; Aluminium construction.

Lian Li is increasingly designing itself into a corner. With the spun-off Dragonlord range of budget cases, the argument for Lian Li's upper range price-points is starting to wear awfully thin. What's more, Lian Li cases within a similar bracket are starting to negatively compete with one another.

Case in point: the PC-A77F. On paper the specs are impressive enough, but dig deeper and look at other cases at a similar price point and you'll be tempted to pass this one over.

The exterior is the first sign of trouble. Lian Li built a richly deserved reputation for minimalist design, but recent efforts suggest that purity of vision's been diluted somewhat. The front fascia is all metal, but the curtailed angles make it not only look cheap and unlike a Lian Li design, but it also like it should be plastic. It's not, and is in fact very sturdy, but that's the impression we get. The sides and top are better – plain matte black aluminium. The top houses two fan grills, power buttons, and an impressive IO panel with eSATA, audio and four USB 3.0 ports. The power buttons are the usual milled metal, and while the feel as solid as we could want, they are very squeaky.

The rear is shiny, un-treated metal, with everything you could want – two water-cooling

grommets, a fan exhaust, eight expansion slots and even a grill at the top of the backplate in case you want to install a radiator. It's solid, but nothing exciting.

Which also pretty much sums up the interior. It's all untreated metal again, and there's a lot of good stuff on display but – again – you run into the asking price.

The drive cage set up is great – essentially twelve 5.25in bays, with three smaller, removable cages screwed in to accommodate nine 3.5in bays – and each of these bays has a 120mm fan attached. As shipped, the top three 5.25in bays are clear, but you could easily swap the bays around if you want a non-standard install. Both smaller cages and the larger 5.25in slots are tool-less in design, and very sturdy.

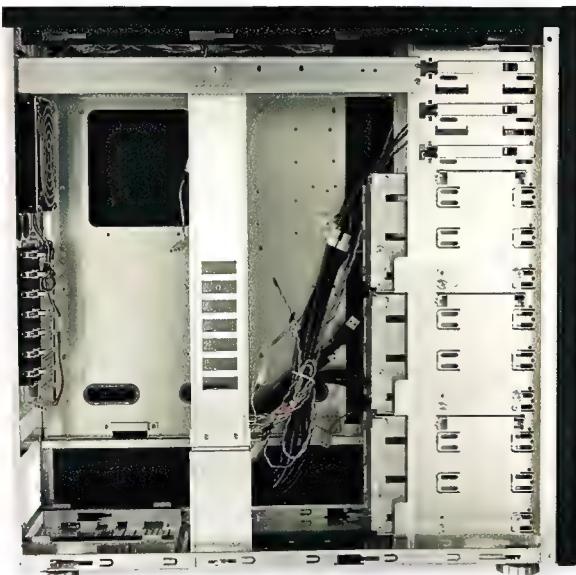
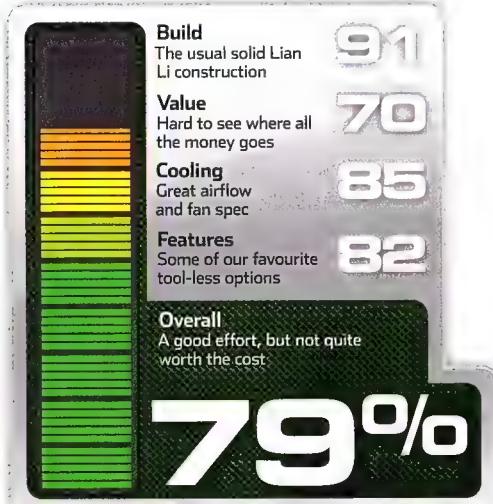
The rest of the interior is similarly specced. The expansion slots use the tool-less lever system that we've loved in past Dragonlord and Lian Li cases, and all the expansion covers are well ventilated. Speaking of which, there are two 120mm fans in the case's top, and one in the rear panel, making for a well-cooled interior – this is a great case for overclocking on air alone.

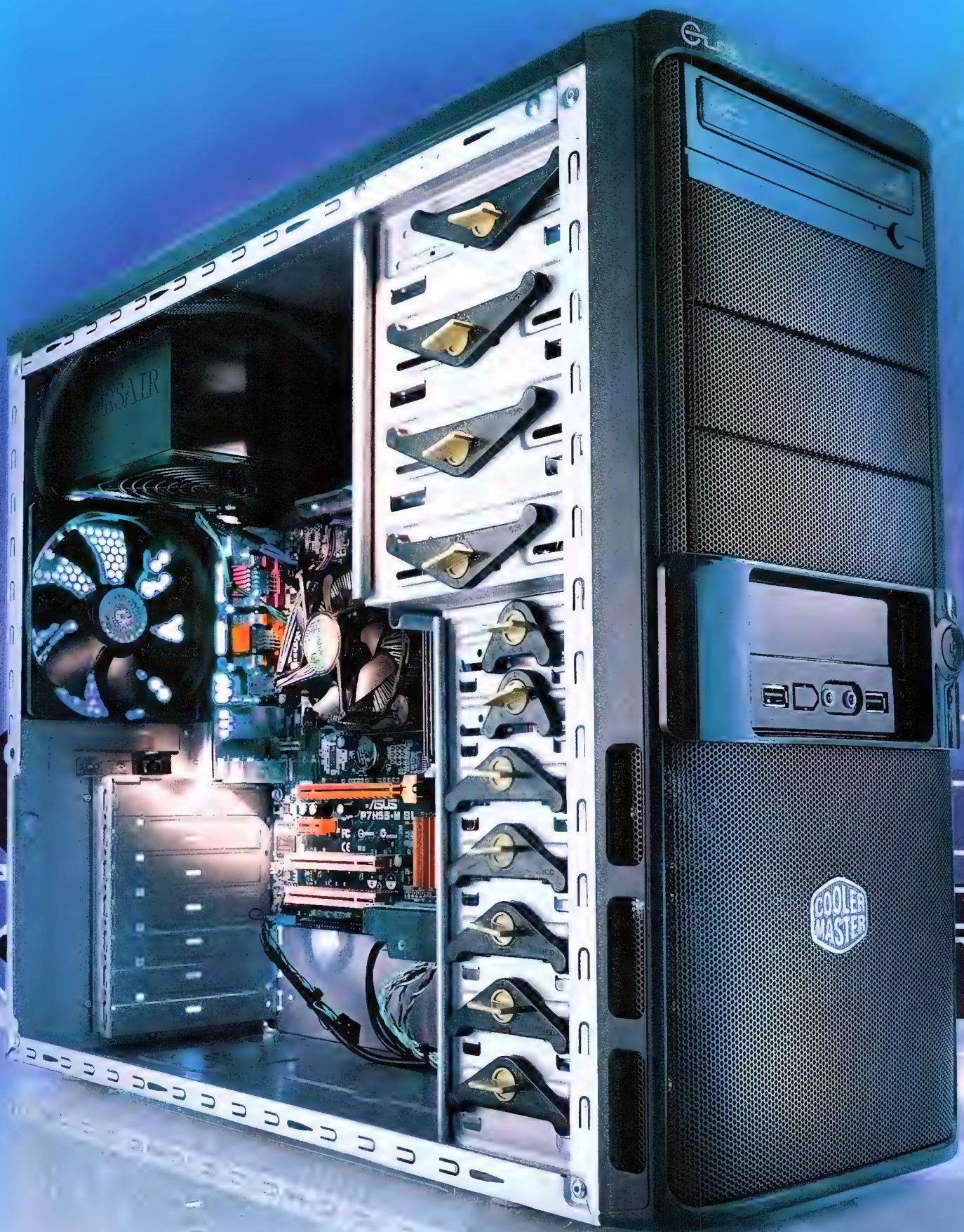
The motherboard plate is well designed, with a cutout for the CPU mount, and smaller, plastic lined cut-outs to help run cables from the PSU behind the main plate. The tool-less design even runs to PSU, with a levered metal bar included in the case's box of bits to fit over your power

supply. Another bracket braces the case top-to-bottom which you can install small plastic risers into to help support larger graphics cards. Speaking of such cards, the PC-A77F can fit cards up to 365mm long, which is plenty of room for almost anything on the market. It's all very solid, very well built... and kind of uninspiring.

It's the price that's the killer. For a similar amount you could get the awesome and over the top X1000 – a case truly worth the asking price. On the other hand, for far less, you can get cases of a very similar spec. About the only thing that really sets the PC-A77F apart, and marks it out as worth the money, is if you really must have an M-ATX motherboard.

Otherwise, we think there are more exciting cases for the money, and cheaper cases that will suit most enthusiast just as well. 





How to build a future-proof PC

Building your own PC gives you total control over the components inside, allowing you to customise them to your requirements. **James Gobold** shows you how to build a low-budget system that can be cheaply and easily upgraded into a little speed demon.

Unless you're an absolute top-of-the-line must-have-the-best type of gamer, there's simply no need to buy an expensive Core i7 processor and half a ton of RAM. That said, there's a limit to how little you spend before performance becomes a factor and even basic applications and classic games start to crawl. For instance, while it may be tempting to build a budget system around an Atom CPU, they're frustratingly slow even at simple tasks, so you'll end up regretting buying one.

To avoid these pitfalls, this feature guides you through the process of buying and building a cost-effective system that has plenty of horsepower for current and future applications. Costing well under \$1000, including Windows 7, it's a brilliant budget workhorse.

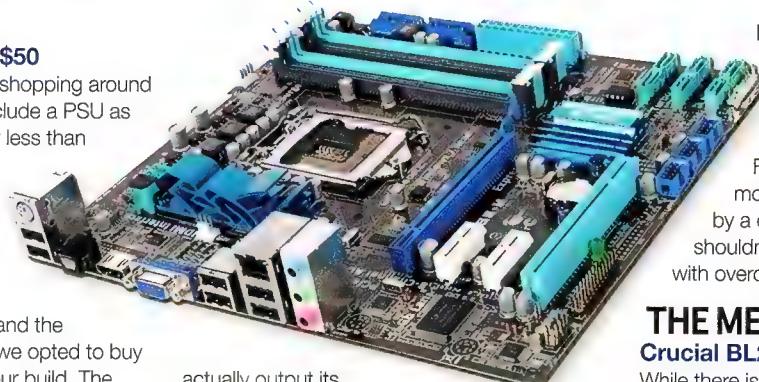
If you're a keen gamer or your budget can't stretch any further right now, we've also included a guide on how to upgrade this PC into a little speed demon, giving it a cutting-edge DirectX 11 graphics card and turbocharged, overclocked CPU.

CHOOSING THE COMPONENTS

THE CASE

Cooler Master Elite 335, \$50

You have to be very careful when shopping around for a budget case, as many include a PSU as well. While a case and PSU for less than \$60 might sound like a bargain, it isn't. This is because the PSUs included in such bundles are old, under-spec models that won't be able to power a modern PC, as they have very weak 12V rails and the wrong connectors. Therefore, we opted to buy a separate case and PSU for our build. The case in question is a Cooler Master Elite 335, a diminutive little case that can handle both ATX and micro-ATX motherboards, and includes a single 120mm exhaust fan. Unlike a lot of cases at this price point, its front panel doesn't look like the end result of botched plastic surgery.



THE PSU

Corsair CX400W, \$80

You have to be very careful when buying a budget PSU (see our comments above), as many models simply can't cope with the power demands of modern components. Unfortunately, at this price, you won't find any modular PSUs, but the Corsair CX400W is still a great buy. Unlike most budget PSUs, it can



actually output its claimed 400W for hours on end, plus it runs cool and is fairly quiet. The CX400W is also reasonably efficient, maintaining 84 per cent at full load.

THE PROCESSOR

Intel Pentium G6950, \$110

There's an enormous choice of budget processors at the moment; should you go with an AMD Socket AM2+ chip, a brand new Intel LGA1156 model or one of the ageing Intel LGA775 CPUs? The Intel LGA1156 platform offers the most flexibility, as most of the CPUs in this family have an on-board GPU, so unless you're planning some serious gaming with your budget system, there's no need to buy a discrete graphics card. The chip we chose is the little-known Pentium G6950. This may be the cheapest LGA1156 CPU you can buy, but it has two cores, runs at a healthy 2.8GHz and sports 3MB of cache. In the standard version of our PC, the CPU is cooled by the reference Intel HSF included for free with the processor.

THE MOTHERBOARD

Asus P7H55-M, \$100

We probably review more motherboards than any other product in the pages of Atomic (with the exception of video cards), but even so, choosing a budget model that has all the features you need can be tough. For example, many cheaper motherboards only have two DIMM sockets, making it costly to upgrade in the future, as you'll have to ditch your existing RAM before fitting any more memory. The Asus P7H55-M is unusual in having four DIMM sockets, so it doesn't suffer from this problem.

As it's based on the Intel H55, the Asus P7H55-M supports the on-board GPU inside the Pentium G6950 CPU. If you feel the need for more graphics processing power, the Asus P7H55-M has a 16x PCI-E 2.0 slot that's perfect for the job of housing a graphics card.



It also has good-quality on-board sound, plus a half dozen USB2 ports, which is more than enough for even the most gadget-obsessed geek. Finally, unlike a lot of cheaper motherboards, the VRMs are cooled by a dedicated heatsink, so they shouldn't overheat if you decide to dabble with overclocking.

THE MEMORY

Crucial BL2KIT12864BN1608, \$90

While there isn't a noticeable performance delta between different memory modules, we'd always recommend buying branded, rather than generic OEM memory. Branded memory is made from higher-quality DRAM chips and is backed by a warranty. In addition, when it comes to upgrading, you're far more likely to be able to buy the same branded memory again, while generic OEM DIMMs change from week to week.



For our build, we've gone one step further; instead of buying the RAM from a normal retailer, we recommend buying the memory direct from the manufacturer – in this instance, Crucial. This has the added advantage that if anything does go wrong, you're already in direct contact with the manufacturer and don't have to go through a retailer.

THE HARD DISK

320 GB Western Digital WD3200AAJS Caviar Blue, \$70

As there isn't a significant performance difference between different hard disks at this level, and SSDs are still way too expensive to consider for a budget build, you should choose the hard disk based on how many gigabytes of storage it provides per dollar you spend. Few drives can match the Western Digital





THE OPTICAL DRIVE

Samsung SH-S223C, \$25

These days, it's unlikely that you'll be using an optical very often – many people will probably only ever use it once: to install the operating system. That said, a DVD writer such as this Samsung drive provides a cheap and cost-effective method of backing up data, as 4.7GB blank DVDs can be bought for less than a dollar these days.

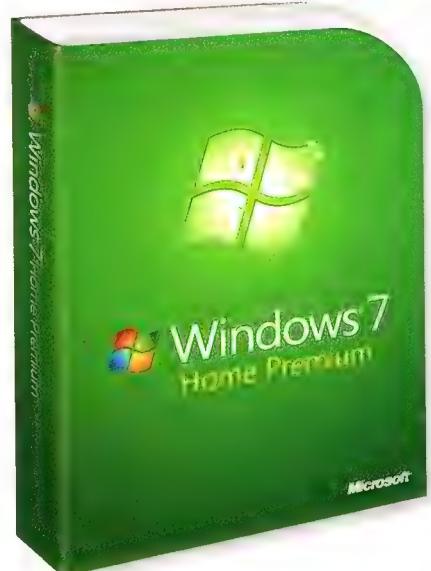
THE OPERATING SYSTEM

Windows 7 Home Premium, \$105

Although you could install a free version of the Linux operating system, Windows 7 has many more applications (both free and commercial), and it's much easier to use and far superior for gaming. For a budget PC such as our machine, the most suitable version of Windows 7 is Home Premium 64-bit, which you can save some money on if you buy the OEM version.



Caviar Blue – for just \$70, it provides 320GB of storage, which is plenty for Windows, and a slew of music tracks and photos. Even if you do run out of storage space, the motherboard and case can support four more hard disks, so there's plenty of headroom for expansion in our build.



BUILDING YOUR SYSTEM

Once the initial excitement of all the lovely shiny boxes arriving has started to wear off, you need to assemble all the components into a PC. This step-by-step guide walks you through the principal stages of this process.

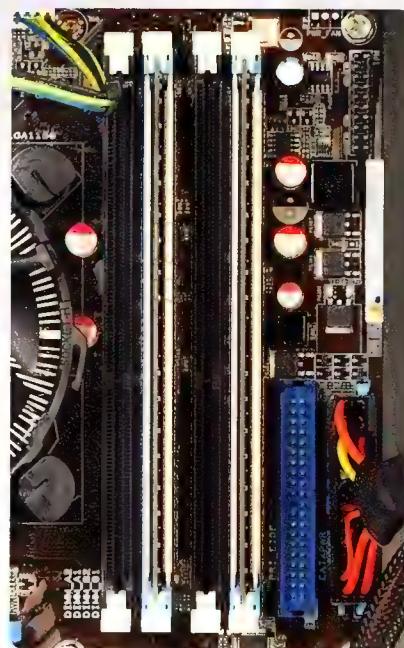
1. THE CPU, COOLER, MOTHERBOARD AND RAM GET-TOGETHER

Although the order in which you install the components doesn't particularly matter, you'll find it far easier if you attach the CPU, cooler and RAM to the motherboard before you screw the latter to the case. The first step is installing the CPU into the LGA1156 socket in the motherboard. To do this, prise up the spring-loaded arm up from the side of the metal bracket surrounding the socket – this in turn will lift up the retention plate, revealing the socket underneath.

Peel away the protective plastic cover and gently – the 1156 pins in the socket are very thin and easy to bend – insert the CPU, matching up the two notches in the sides of the CPU with the appropriate tabs on the metal bracket on the motherboard. Once the CPU is lined up correctly, gently push the retention bracket and spring-loaded arm back down, locking the arm in place to prevent it coming loose.

The next stage is quite awkward, as Intel continues to use a fussy push-pin retention mechanism for its CPU coolers. You should start by sitting the heatsink flat on top of the CPU. Then, making sure that the push-pins are rotated so that the ratchet inside can't pop up, push down one push-pin. You should hear a click when the push-pin is firmly seated in the underside of the motherboard.

If everything looks okay, push down the

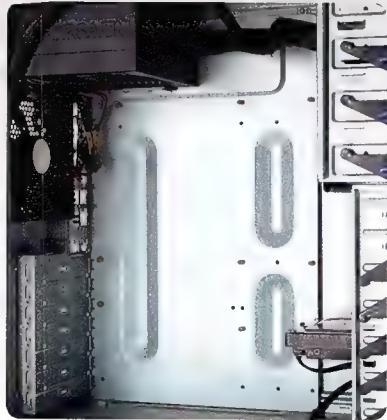


push-pin diametrically opposite the one you first attached so that the heatsink is held flat onto the CPU before attaching the last two push-pins. If one of the push-pins doesn't feel right, don't panic, as they can be easily reset to their out-of-the-box configuration by twisting the top through 90 degrees – thus releasing the ratchet inside so that the pin inside can be raised.

Now that the CPU and cooler are fixed in place, you should install the memory DIMMs. The standard version of our build includes two DIMMs, which should be installed in the blue sockets so that the memory runs in its optimal dual-channel mode. The DIMMs are held in place by white plastic latches at either end of the DIMM sockets – simply pull these back to insert the DIMMs, then push them back snug against the DIMMs.



2. THE CASE, MOTHERBOARD AND PSU HOOK UP



As the Cooler Master Elite 335 case is quite small, and therefore a little cramped inside, we recommend installing the PSU before anything else. You'll also find the following stages much easier if the case is lying flat on its side, rather than standing upright – that way, you won't be constantly fighting gravity. The PSU sits in the top rear corner of the case and is held in place by four screws that attach it to the back of the case. Don't worry about the cables for now – simply push them out of the way outside the case.

Before you install the motherboard in the case, you should install the I/O shield – the rectangular piece of metal with holes for the ports on the back of the motherboard. This can be found in the motherboard box and should simply click into the appropriate hole in the back of the case.

Once the I/O shield is securely fastened, you can begin installing the motherboard in the case. This is held in place by five screws that pass through the motherboard into stand-offs, which are screwed into the case. You can work out into which holes in the case these stand-offs should be screwed by holding the motherboard over the case. The stand-offs are best fixed into the case using a socket screwdriver, but a pair of pliers will also do the job. Now put the motherboard back into the case and screw it down onto the stand-offs.

3. DRIVES AND CABLES ARE CRAMMED IN

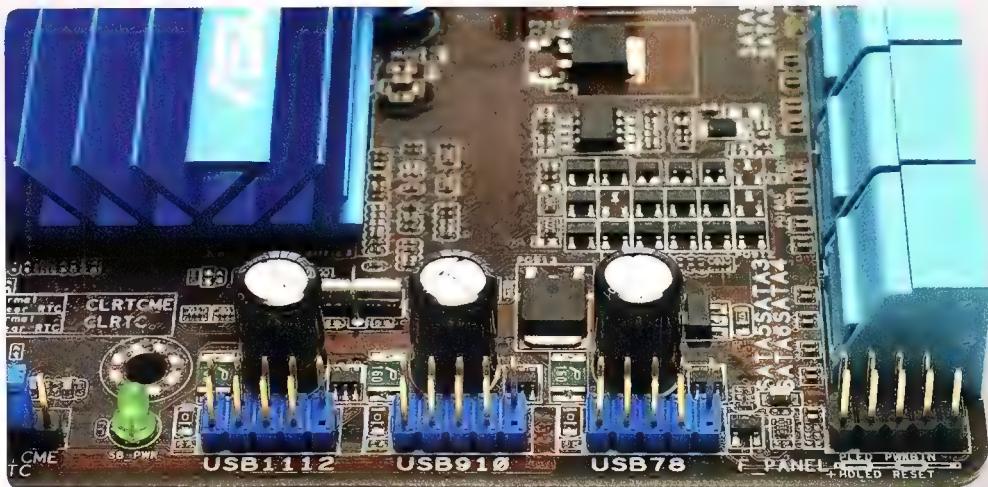
You should now install the hard disk and optical drive. The former can be mounted in any of the 3.5in drive bays inside the case, but the latter will require a 5.25in bay – the front of these bays are obscured by plastic covers. Once one of these covers has been removed, screw the optical drive in place, making sure that the leading edge of the drive is lined up with the front of the case. In contrast, the hard disk is held in place by a rotating tool-less plastic clip.

Now that all the main components are installed, you should connect the cables between the PSU, motherboard and drives. Try to keep these as tidy as possible by hiding them out of the way of the main chamber, as this will improve airflow in the case, reducing noise and lowering the temperature of the components inside. For the basic version of our build,

you'll need to hook up the 24-pin ATX and 8-pin EPS12V connectors from the PSU to the motherboard, plus a SATA connector from the PSU to each drive. You'll also need to connect a SATA data cable between each drive and the motherboard.

Don't forget to also hook up the front-panel

wires (power, reset, audio and USB) to the tiny headers on the motherboard. These cables are labelled and colour coded, but you'll need to find the appropriate headers to which they connect by reading the motherboard manual, paying particular attention to which is pin-1 on each header.



4. INSTALLING WINDOWS ON YOUR NEW BOX

Before you can install Windows 7, you need to set your optical drive as the primary boot device. Head into the BIOS by pressing Del when your PC starts, and go to Boot Device Priority, which is under Advanced BIOS Options. Set the optical drive to the first device and the hard disk to the second, save the settings and restart the PC. You can then insert your Windows 7 DVD and press a key to boot from it when prompted.

You'll then be taken through the installation process. Once you've chosen your country you'll be presented with the installation

screen, where you'll need to select Advanced Options. Here you can create a new partition by clicking the New button and entering your chosen capacity.

If you want only one partition, click on the Next button without changing the numbers. However, if you want two equal-sized partitions – perhaps one for the OS and apps, and one for data – then divide the number by two and click on Next.

You can now assign the remaining space to a secondary partition. Select the partition to use as a system disk and choose Start.

Once Windows is installed, download the latest drivers from the manufacturers' websites. For your Intel graphics driver, head to www.intel.com. You'll also need the drivers for the motherboard chipset and onboard components, such as the audio codec and network port. These drivers can be found on the driver CD in the motherboard box or downloaded from www.asus.com.

Install the chipset driver first, then the graphics and audio drivers and then the rest. Make sure you restart the PC after each driver installation.



Enter your BIOS and head to Boot Device Priority, which you'll find in the Advanced BIOS Options menu. Not every BIOS has the same wording, but it will be similar.



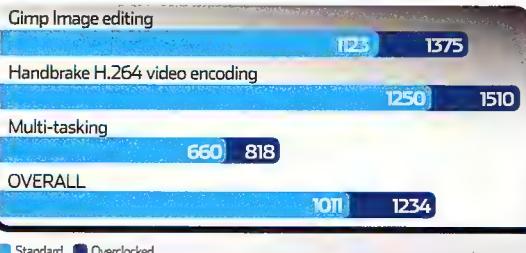
Set your optical drive (DVDROM) to be the first boot device so that your computer can boot straight from the Windows 7 disc.

Performance

To show just how much performance the basic version of our system provides, we ran it through our Media Benchmarks. You can download these from <http://tinyurl.com/ygobmkv> and run them on your PC to determine how much faster our system is.

As the on-board graphics in the CPU aren't designed to run the latest games with the detail settings maxed out, we didn't run any game benchmarks on our system. However, it can easily play any of the free Flash games available from sites such as www.armorgames.com. While the PC at default speeds is fine, you can increase its performance by following our overclocking guide, as the graphs below show.

Results



Overclocking

Although the Pentium G6950 CPU in the basic version of our system is fast enough for basic tasks such as web browsing, there are always some tasks that require more computing power.

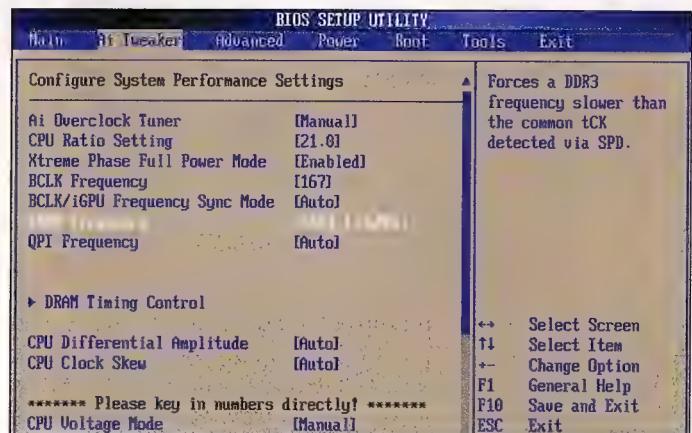
Fortunately, you can obtain additional performance from your PC without spending more money simply by overclocking it. Overclocking is the process of boosting the clock frequency of the CPU and motherboard beyond their default speeds. Components are generally so well built these days that they have plenty of headroom.

However, there are some issues to be aware of before you start overclocking. First, as soon as you overclock a component, it produces more heat, so it's crucial that you keep everything inside your PC cool. Secondly, there's a tiny chance that you'll damage your components if you set voltages too high, so it's important that you double check any settings you change.

To avoid these pitfalls, we've compiled this step-by-step guide to the changes you'll need to make in the BIOS to overclock your rig.

Once you've entered the changes we describe here, you should stress test your PC to make sure that it will run applications stably. To do this, you need to download Prime95 from www.mersenne.org and Core Temp from www.alcpu.com/CoreTemp. The former is a synthetic load-generating program; using the 'smalldft' option will fully load the two cores of your CPU. If Prime95 runs for 24 hours without crashing or generating an error message, your overclock is stable. You can also run Core Temp in the background to monitor the temperature of your CPU. If the readout in CoreTemp goes above 39°C at idle, the cooler probably isn't fitted correctly, so check this before trying to run Prime95 again.

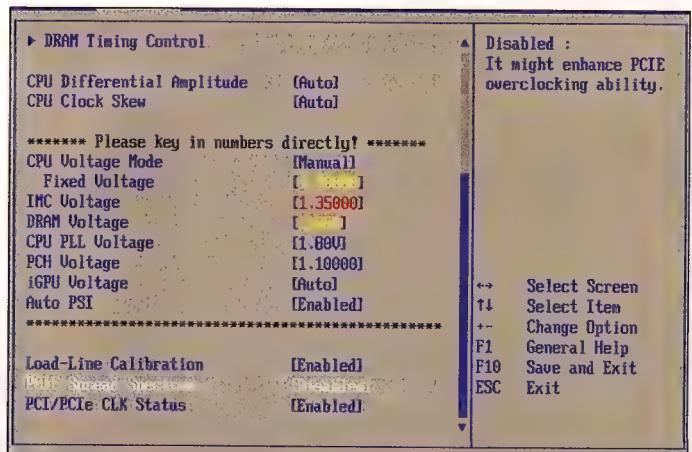
The overclock we've chosen isn't necessarily the fastest you could coax from these components, as the overclockability varies between different CPUs, but it should work with the vast majority of Pentium G6950s. If not, don't panic – try adjusting the CPU voltage up and down by the smallest fraction that the BIOS allows, and run Prime95 and Core Temp again.



To overclock your CPU from 2.8GHz to 3.5GHz enter the Ai Tweaker menu and change the 'AI Overclock Tuner' from 'Auto' to 'Manual'. This will unlock the BCLK and DRAM frequency controls. Increase the former from 133MHz to 167MHz, and set the RAM to 133MHz – the fastest value that the BIOS supports.



Now we need to increase some voltages to stabilise the overclock. We recommend increasing the CPU voltage, which Asus refers to as 'Fixed Voltage', to 1.3V, the memory controller (or 'IMC Voltage') to 1.35V, the memory (or 'DRAM Voltage') to 1.65V, the 'CPU PLL Voltage' to 1.8V and the 'PCH Voltage' to 1.1V.



Finally, at the bottom of the 'Ai Tweaker' menu, you should enable 'Load-Line Calibration' and disable 'PCI-E Spread Spectrum'.



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UPGRADING YOUR PC

Upgrade
+ 416 = 956

Over the next two pages, we show you several cost-effective upgrades that will transform your PC from a basic workhorse into a little speed demon that's capable of running the latest games and applications with ease.

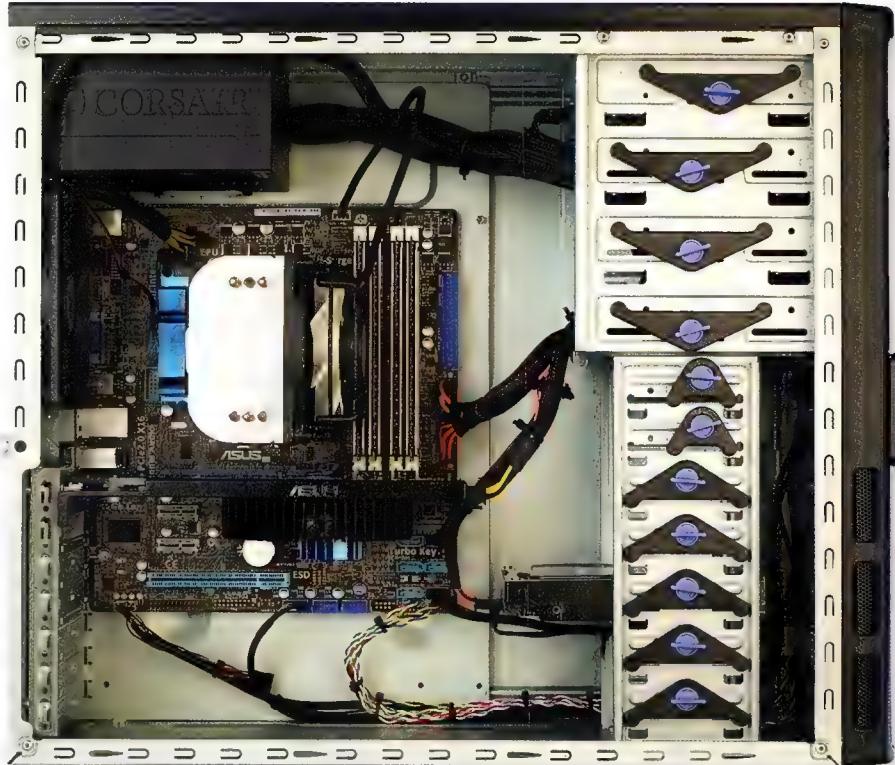
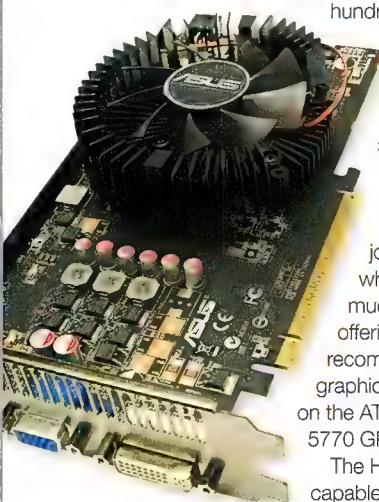
THE GRAPHICS CARD

Asus EAH5770, \$200

If you want to play the latest generation of DirectX 11 games, the most important upgrade to consider is a discrete graphics card. You have to be extremely careful when choosing a graphics card, as there are literally

hundreds of different models to choose from, and they all have slightly different specifications. Fortunately, we can make the job of choosing which to buy much easier by offering just one recommendation – a graphics card based on the ATI Radeon HD 5770 GPU.

The HD 5770 is capable of playing all latest games at medium resolutions, and in the guise of this Asus card, it's relatively cheap. However, be warned; don't be tempted to buy anything cheaper than a HD 5770, as it simply won't be powerful enough to play the latest games smoothly.



the

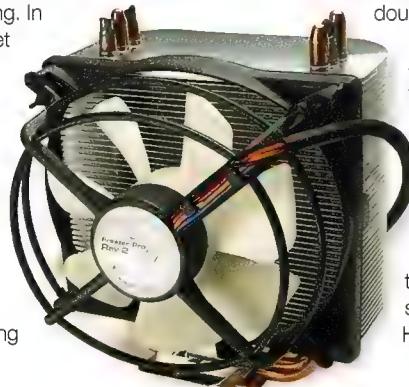
you to overclock the CPU much further. As an added bonus, the Freezer 7 Pro Rev.2 is also quieter than the stock Intel cooler.

THE COOLING

Arctic Cooling Freezer 7 Pro Rev.2, \$36

Although the heatsink and fan in the basic version of our system is adequate as long as you don't overclock the CPU too much, it's neither particularly cool nor particularly quiet. Given that a third-party CPU cooler is the cheapest upgrade you can make, it's definitely worth doing. In keeping with the budget theme of this feature, our choice for a replacement CPU cooler is the Arctic Cooling Freezer 7 Pro Rev.2.

It's slightly more awkward to install than the stock cooler, but it provides far superior cooling, allowing



THE MEMORY

Crucial BL2KIT12864BN1608 2x\$90

While you can get away with just 2GB of RAM for running most applications, you'll find that Windows 7 will boot much faster and run more smoothly with more memory. This is especially true if you want to run several applications in parallel. We recommend

doubling the amount of RAM in your PC from 2GB to 4GB by buying another two 1GB DIMMs of Crucial memory.

When adding additional memory to your PC, it's critical to use exactly the same modules as those already installed – if they're mismatched then the system may not run stably. However, if you're building the

upgraded version of our system from scratch, rather than upgrading after a few months, you'll find it slightly cheaper to buy two 2GB DIMMs rather than four 1GB DIMMs. In this situation, we'd recommend buying the Crucial BL2KIT25664BN1608.



THE BENEFITS OF UPGRADING

Overclocking

The main impetus for providing an upgrade guide for the basic version of our budget PC was to enable it to play DirectX 11 games. However, we didn't just add a discrete graphics card, but also doubled the amount of system RAM and fitted a high-performance, third-party CPU cooler.

The Freezer 7 Pro Rev.2 provides much better cooling than the stock Intel cooler, allowing us to overclock the CPU even further. For example, with the stock Intel cooler, we could only overclock the CPU from 2.8GHz to 3.5GHz without the CPU overheating. However, with the Freezer 7 Pro Rev.2 fitted, we could boost the processor frequency to 4GHz without the CPU becoming too hot for comfort.

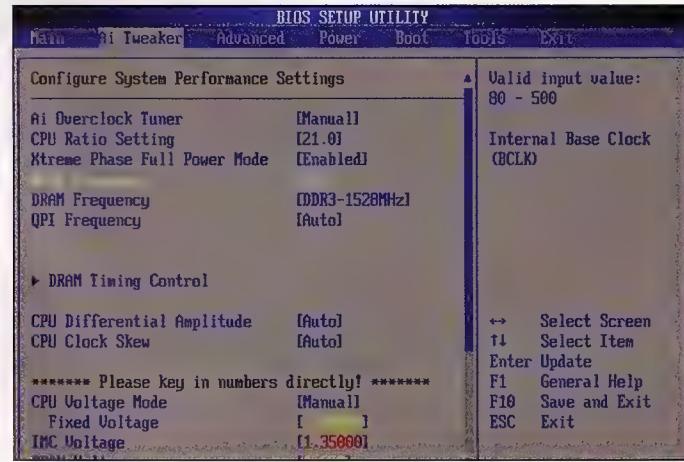
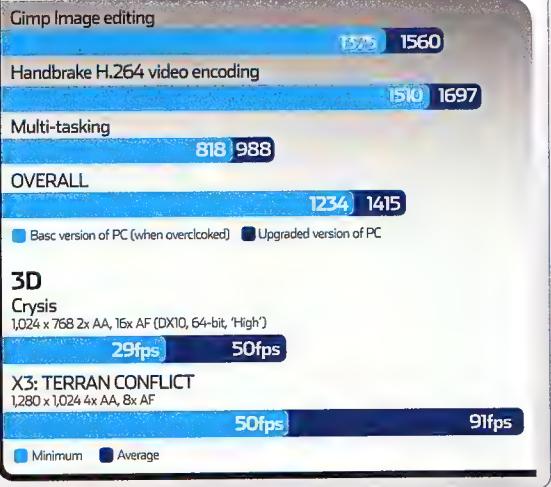
The following screenshots show how we went about overclocking the G6950 CPU with the Freezer 7 Pro Rev.2 cooler fitted. As in the basic version of the build, your mileage may vary slightly due to the variable quality of CPUs, but most G6950s should overclock stably using these settings. Before you run any applications, you should always stress test an overclock with the 'smalldff' test in Prime95 (www.mersenne.org). Ideally, you should be able to leave it running for 24 hours without it crashing or detecting any errors.

Performance

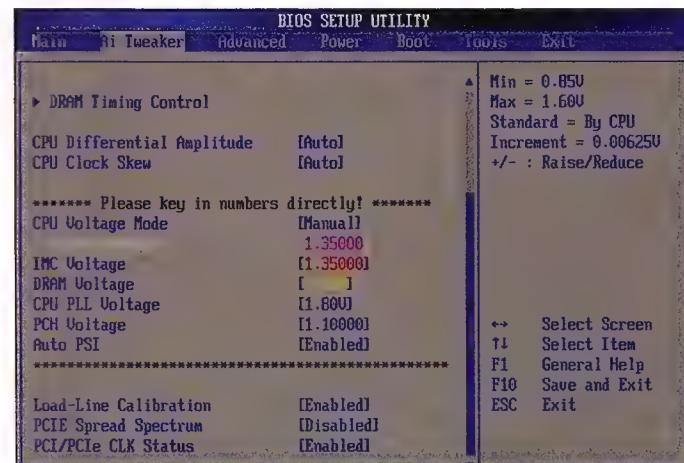
To show how much of a benefit our three upgrades provide, we benchmarked the upgraded version against the original. As the graphs show, the upgraded PC was 15 per cent faster in Media Benchmarks, which was a very welcome improvement given the relatively low cost of upgrading.

In gaming, the difference is even more stark. For example, while the on-board GPU struggled to play anything more demanding than a Flash game, thanks to the addition of the HD 5770 graphics card, the upgraded version could play even the most graphically demanding games smoothly.

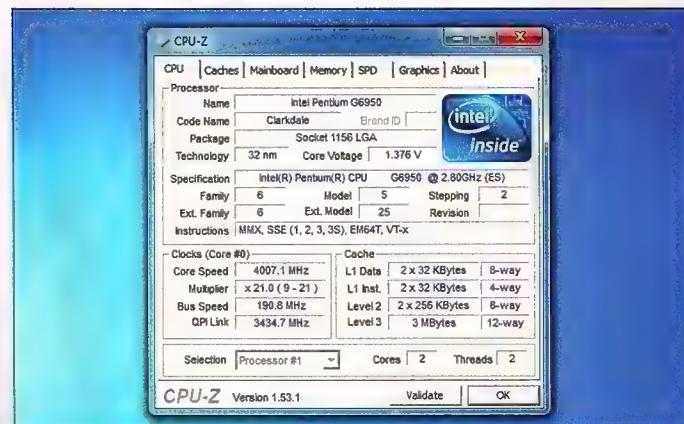
Results



You only have to make two changes in the BIOS to overclock the Pentium G6950 from 3.5GHz (as detailed on p116) to 4GHz. The first of these is to increase the Base Clock, which Asus refers to as the 'BLCK Frequency', from 167MHz to 191MHz.



The only other change you need to make is to increase the voltage of the CPU, which Asus refers to as the 'Fixed Voltage', from 1.3V to 1.35V.



The CPU in the upgraded version of our rig now runs at 4GHz, a staggering 43 per cent faster than its default frequency. Thanks to the additional memory, its performance is in a completely different league.

KITLOG

These are our four basic systems, with something for every taste. On this page, the **Basic Game Box** is put together with money-saving in mind, but also an eye to getting as much bang for buck. It's the best value system for those who want a lot of processing grunt, but who don't want to sacrifice the upgradeability or compatibility that is so important. Intel's going to keep the P55 socket around for quite some time, so making the leap to this new platform is well-timed.

The limitations of rotating storage media are relatively plain; there's only so fast you can practically spin a disc. This means that although the hard drive is high-capacity and cheap, it isn't going to be able to touch solid state technology. After all, solid state doesn't need to spin to get moving – but it is also expensive. Seagate announced the Momentus XT recently; a fusion of cheap storage discs and faster flash to boost system speeds. One to keep an eye on.

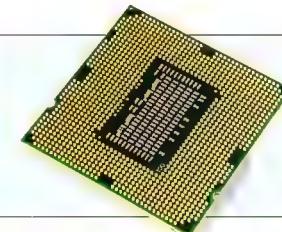


The Perfect PC, on the other hand, is the system everyone aspires to, with nothing but the best parts – without going crazy, though. It's a collection of all the greatest hardware that we'd pick without a budget, sure to impress with performance and sheer style.

Oh, and if you're wondering what the Ref IDs are, that's the ID of that article on our website. Just enter it like this – www.atomicmpc.com.au/?NUMBER – and you'll go straight to that review.

BASIC GAME BOX

CPU

**Intel Core i5 750**

PRICE \$240

Intel's budget quad is more than you'll need in a chip!
Issue 106, Page 36

MOTHERBOARD

GIGABYTE P55-UD4

PRICE \$225

A great value P55 board with some nice features.
Issue 106, Page 39

MEMORY

**G.Skill Ripjaws 2000MHz**

PRICE \$190

Great value memory with amazing overclocking.
Issue 106, Page 52

VIDEO CARD

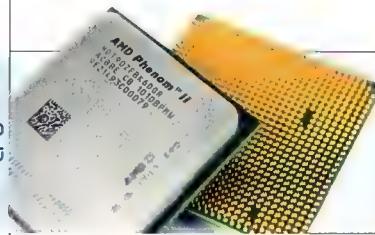
XFX 5770

PRICE \$200

A decent value way to get into DX11.
Ref ID: 169775

THE PERFECT PC

CPU

**AMD Phenom II X6 1090T**

PRICE \$365

Six cores of high-powered processing joy.
Issue 114, Page 36

MOTHERBOARD

MSI 890FXA-GD70

PRICE \$265

A high-end AMD platform with full CrossFire support, great OC'er.
Issue 114, Page 38

MEMORY

**Corsair Dominator GT CMG4GX3M2A2000C8**

PRICE \$400

Red-hot memory for dual-channel speed.

VIDEO CARD

ATI 5970

PRICE \$830

A dual-cored DX11 beast, the most powerful yet.
Ref ID: 173167

For more builds check out the Kitlog E-mag at atomicmpc.com.au/kitlog

SUBTOTAL: \$1690



Coolermaster Hyper 212 Plus
PRICE \$50

Nice cooling for a very affordable price.

1TB HDD
PRICE \$100

A thousand gigabyte storage drive on the cheap.



Viewsonic VX2233WM
PRICE \$215

21.5 inches of value-packed screen, great buy.
Issue 108, Page 42



CASE



Lancool Dragonlord PC-K62

PRICE \$165

Vibration damped, great cooling and sexy looks.
Ref ID: 160151

Plantronics Gamecom 777

PRICE \$85

Solid set of cans with great audio.
Issue 101, Page 41



Onboard Realtek ALC889A

A decent chip that does the job.



Noctua NH-U12P SE2
PRICE \$95

Two fans, quiet and nice overclocking capacity.
Issue 107, Page 48

KEYBOARD



Razer Arctosa
PRICE \$50

A cool-looking keyboard that'll serve you very well.
Ref ID: 149483

MOUSE



Verbatim Rapier V1

PRICE \$65

Great gaming performance and nifty features.
Issue 96, Page 43

POWER SUPPLY



OCZ ModXStream Pro 600W

PRICE \$105

Plenty of wattage, reliable, modular for neatness.
Issue 109, Page 59

SUBTOTAL: \$5308

Coolermaster ATCS 840

PRICE \$370

Heaps of fans, plenty of space, and dripping with quality.
Ref ID: 132479



OCZ Vertex LE 100GB & WD 600GB VelociRaptor

PRICE \$530 + \$400

Superfast SSD with zippy storage.
Issue 113, Page 43
Issue 114, Page 46



CASE

Dell 2408WFP

PRICE \$899

A huge 24in LCD screen for your prettiest pixels.
Issue 103, Page 57



Microsoft Sidewinder X6

PRICE \$95

Backlit, sturdy, magnetic numpad & macro keys; what's not to like?
Ref ID: 129535



KEYBOARD

Logitech Z-5500D

PRICE \$425

Earth-shakingly good.
Ref ID: 22626



Auzentech X-Fi Prelude

PRICE \$279

Best soundcard evar!
Ref ID: 112419

MOUSE



Microsoft Sidewinder X8 Wireless

PRICE \$105

Cable-less, comfortable, lag-free and fraggable!
Ref ID: 148422

POWER SUPPLY



XFX 850W

PRICE \$250

Plenty of power, ultra-stable rails and a great price.
Issue 107, Page 50

THE LAN BOX

The **LAN Box**, the ultimate in portable gaming power – go anywhere, frag anyone. No longer will you be tied to a desk or forced to awkwardly manhandle your full-sized rig, helped by a convenient handle and beefy tech. Perfect for wowing people at LANs, the tech inside is fast enough to run any game, and boasts enough speed to keep your game running at full clip even if other programs intrude in the background. After all, no-one wants to miss a headshot.

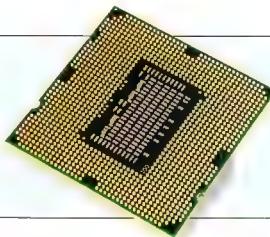
Putting your system together when you've painstakingly chosen all the parts can be tough, so follow these quick tips:

- Install HDDs, PSU and ODD before installing other tech
- Install the processor, motherboard, memory and heatsink before lowering into the case
- Organise your wiring as you build, plan ahead for future upgrades
- Work in a clean, brightly lit environment to avoid accidents



Finally, for the more entertainment-minded – and really, that's all of us – there's our **Home Theatre PC**, ready to play movies and music quietly and efficiently. It's got plenty of speed for video encoding while you're away, but makes very little noise thanks to the passive components used – even the heatsink can be dialed down to emit as much or as little noise as you want. Perfect for leaving next to the big-screen TV for all your media needs.

CPU



Intel Core i5 750
PRICE \$240

Intel's budget quad is more than you'll need in a chip!
Issue 106, Page 36

MOTHERBOARD



GIGABYTE P55M-UD4
PRICE \$195

Great overclockability, nice value.
Issue 107, Page 40

MEMORY



G.Skill Ripjaws 2000MHz
PRICE \$190

Great value memory with amazing overclocking.
Issue 106, Page 52

VIDEO CARD

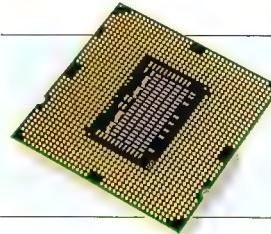


XFX 5770
PRICE \$200

A decent value way to get into DX11.
Ref ID: 169775

THE HTPC

CPU



Intel Core i5 750
PRICE \$240

Plenty of power for HTPC duties, video encoding champ.
Issue 106, Page 36

MOTHERBOARD



GIGABYTE P55M-UD4
PRICE \$195

mATX form factor doesn't skimp on storage, or speed.
Issue 107, Page 40

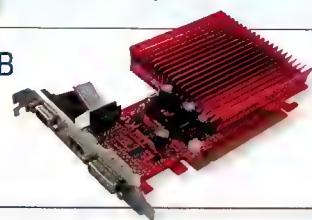
MEMORY



G.Skill Ripjaws 2000MHz
PRICE \$170

4GB of fast memory is plenty for running multiple HTPC media streaming apps.
Issue 106, Page 52

VIDEO CARD



Gainward G210 512MB
PRICE \$55

Perfect for Blu-Ray playback.

For more builds check out the Kitlog E-mag at atomicmpc.com.au/kitlog

SUBTOTAL: \$1634

COOLER



Intel Stock Cooler
PRICE FREE

Does the job, fits under PSU well.

CASE



Silverstone SG04
PRICE \$170

Small case with handle; add two 120mm fans for awesome cooling.
Ref ID: 148266

SYSTEMDRIVE

1TB HDD
PRICE \$100

A thousand gigabyte storage drive on the cheap.



KEYBOARD



Razer Arctosa
PRICE \$50

A cool-looking keyboard that'll serve you very well.
Ref ID: 149483

DISPLAY



Viewsonic VX2233WM
PRICE \$199

21.5 inches of value-packed screen, great buy.
Issue 108, Page 42

MOUSE



Verbatim Rapier VI
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Great gaming performance and nifty features.
Issue 96, Page 43

AUDIO

Plantronics Gamecom 777
PRICE \$85

Solid set of cans with great audio.
Issue 101, Page 41



Onboard Realtek ALC889A
PRICE \$50

A decent chip that does the job.

POWER SUPPLY



Corsair HX-520
PRICE \$140

Modular, efficient and keeps size manageable in cramped case.

SUBTOTAL: \$2337

COOLER



Scythe Big Shuriken
PRICE \$79

Tiny 58mm height, quieter than a sponge.

CASE



SilverStone Grandia GD04
PRICE \$145

Stylish exterior, 3x120mm filtered fans, 2x3.5" HDD space with plenty of room.
Issue 108, Page 47

SYSTEMDRIVE

Seagate Barracuda 1.5T
PRICE \$139

Fast, voluminous storage for all your pr0n, videos and music.
Ref ID: 141622



KEYBOARD



Logitech diNovo Edge
PRICE \$199

Wireless board with a trackpad for mousing.

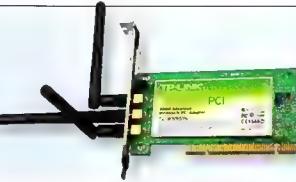
OPTICAL



LG GGC-H20L
PRICE \$175

Bluray and HDDVD playback – best of both worlds

WIRELESS



TP-Link TL-WN951N
PRICE \$55

Zippy 802.11N for wireless HD video streaming.

AUDIO

Razer Mako 2.1 Speakers
PRICE \$469

Stylish tub-thumpers.
Ref ID: 126695



ASUS Xonar HDAV 1.3
PRICE \$270

Nice sound, expansion good.
Ref ID: 135112



POWER SUPPLY



Corsair HX-520
PRICE \$140

Modular and above all quiet for this whisper-soft build.

Lancool



LIAN LI

DRAGONLORD

PC-K62



PC-A77F



Quality is the essence of Lancool products

The Dragonlord K-62 series reflects LanCool's high standards of build quality & rich features. Made by Lian Li, these awesome chassis feature a black interior with completely tool free design and are the perfect solution for any gamers needs.

Craftsmanship is the essence of Lian Li products

Lian Li are the most reputable & renowned PC chassis manufacturer. Lian Li work with exacting quality and workmanship standards, ensuring craftsmanship, durability and useability are all recognised signatures of a Lian Li product.

Lian Li products are always class leading!

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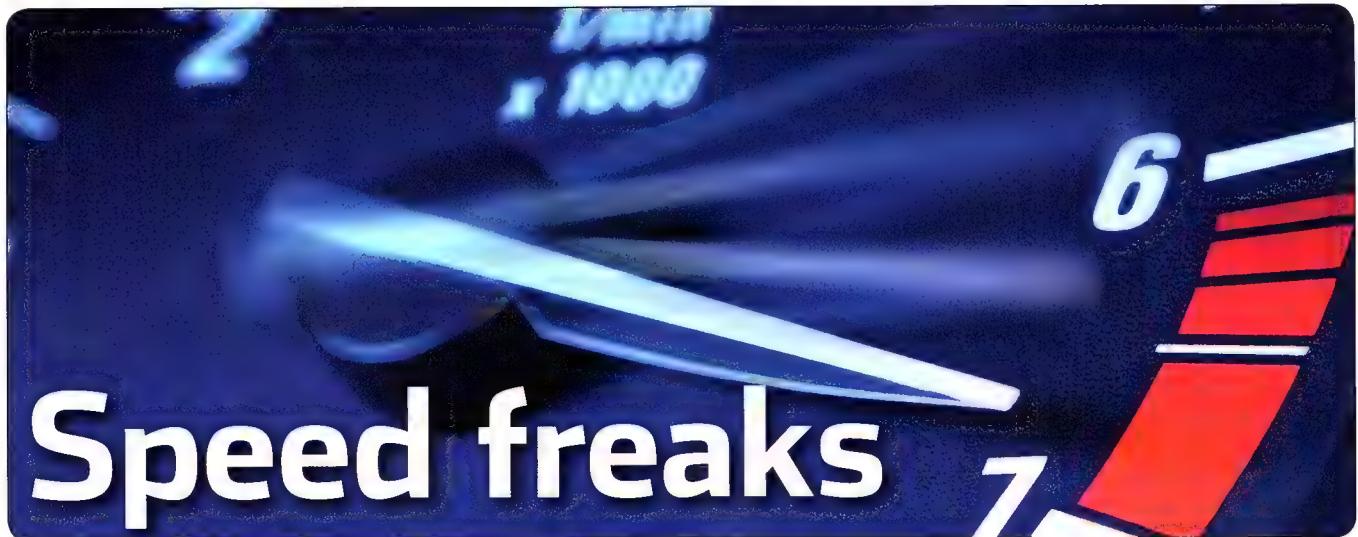
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Speed freaks

Daniel Rutter puts on his running shoes...

There's a Far Side cartoon from the early 90s that depicts 'hopeful parents' anticipating, in the far-off future of 2005, numerous high-paying jobs for Nintendo experts like their hunchbacked geek of a son.

The employment market is not yet what you'd call dominated by professional video gaming. And it never will be, unless games expand into some cyberpunkian VR universe with a demand for new, customised game experiences large enough to generate a new class of service job, somewhere between a barista and a session musician.

There's one tiny segment of the gaming world that's very, very different from the common-or-garden home RPGer ...

But there's one tiny segment of the gaming world that's very, very different from the common-or-garden home RPGer (or, yes, teenager shouting sexual insults at other Halo players).

The players in this small community aren't really playing at all, in the recreational sense. Instead, they have the qualities I expect to see in famous scientists and sportspeople.

They'll spend days, weeks, months, honing skills and testing boundaries, swapping notes and ruminating. They'll try again, and again, and again, hundreds of times. And they're seldom satisfied with the result, because competition is hot.

And thus far, they do all this for free. As a hobby. They even enjoy it.

I am, of course, talking about speedrunners – people who strive to get through a game as fast as possible.

Maybe just getting to the end, by hook or by glitchy crook. Maybe doing a '100 per cent' run, in which you get all the gettables and kill all the killables. Even hundred-percenters often find ways to completely skip substantial chunks of the game.

There are as many kinds of speedrun as there are speedrunnable games. (*Un-speedrunnable* games, like scrolling shooters where everybody getting to the end always takes the same time, are instead the domain of the 'longplay'. I think longplays of Stunt Car Racer, Defender of the Crown and other Amiga classics are an excellent choice for party background-TV.)

Some speedruns are software-assisted, from just using a bunny-hop macro in an FPS, all the way to totally scripted frame-by-frame control of old, emulated games. This latter type is more like writing music than playing a game.

(Some games are much more 'compressible' than San Andreas. The current record for Morrowind, for instance, stands at four minutes and 19 seconds, thanks to shameless exploitation of sequence-breaking glitches. A 100 per cent San Andreas speedrun is in progress as I write this... and has been for some years.)

Perhaps the speedrun is a fad that'll fade away to nothing. If it does, though, I wouldn't be surprised if the reason is that all of the good speedrunners really have gotten the high-paid jobs their dedication deserves.

I don't know who's finally going to invent antigravity or Mr Fusion, or bring peace to the Middle East.

But that kid who beat Duke3D in less than 21 minutes looks promising to me. ☺

Speedrunning? Pft.
Real men do Diablo Ironman runs!
dan@atomicmpc.com.au

But many speedrunners really do play the game with the same gear the rest of us slackers use.

The parallels with other sports come pretty thick and fast. When saving your progress takes time (in a GTA game, for instance), the best way to get a fast aggregate score is by chaining several missions between saves, even if this gives you five consecutive 95 per cent chances of failure. Picking when and how to save is, then, kind of like pit-stop strategies in motor racing.

And then there's 'marathon' speedrunning, with no saves at all, even in games where saving is easy. That's like orienteering. In a live-fire zone.

(A few hardy souls have even tried live speedrunning. That's a combination of sport and theatre.)

All this is a perfectly pointless pursuit, of course, but so's golf. And I for one am a lot more impressed by Daniel 'CannibalK9' Burns getting through the whole main plot of GTA San Andreas in a mere six hours and nine minutes (his videos have a commentary track!) than by Tiger Woods doing... whatever it is that he does.



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New Memory Breakthrough

Have both high speed and huge capacity

Trident Series

DDR3-1600 CL7 8GB(2*4GB)

DDR3-2000 CL8 12GB(3*4GB)

G.Skill previously demonstrated 24GB of DDR3 at 2,000MHz CL9 during Computex 2010 earlier this month, but has again managed to push the boundaries. This super capacity kit has already attracted numerous extreme gamers and professional users who expect higher-capacity memory to maximize their PC performance. Testing with extreme gaming systems G.Skill has successfully provided 24GB (4GBx6) at 2,000MHz CL8 to another high-end boundary, making it the absolute ultimate choice for the extreme users with 8GB(2*4GB), 12(3*4GB), 16(4*4GB), 24(6*4GB) memory kit.



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Blacktea Tech <http://www.bttech.com.au>
Computer Alliance <http://www.computeralliance.com.au>

TUTORIAL

HANDS-ON TUTORIALS FOR THE TECHNICALLY MINDED

So you've gone and made yourself a video game. Nicely done! Now you probably want people to notice it and start playing, either so they can get online and rave about how awesome it is until the nice people at the big end of town notice and start throwing money at you, or so they find all the bugs that you missed and tell you about them so you can make your game better before showing it to the nice people at the big end of town.

Either way, if you're going to catch the attention of the big end of town, you

need to get it out there, and this month, out of the goodness of his heart (and also because we paid him to) (and probably also because he's hoping if you strike it big using his advice that you cut him in for a share of the profits), Chris Taylor takes you through the dark arts of independent game distribution.

Just promise us one thing: when the call does come, don't forget who helped get you there ...



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Chris Taylor takes you through the fine art of distributing your video game creations.	

atomic
MAXIMUM POWER COMPUTING WEEKLY NEWSLETTER

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KITLOG

Issue 3, March 2010

The essential guide to building and cooling your next computer.

Do you like building systems?

Are you keen to always know the best hardware for any PC build or rig? Then you need to check out our new KitLog eBook, a quarterly online publication dedicated to showing you the best gear for more than a half-dozen PC projects.

Only available at
www.atomicmpc.com.au/kitlog

Distributing and marketing indie games



Chris Taylor helps you get it out there.

Developing your own game is an excellent way of showcasing your skills to potential employers in the games development industry. If you undertake tertiary studies in games development, you're bound to work on a couple of group or whole class games. You might produce an excellent game, but it will be difficult to convince an employer that your contribution was a significant factor in ensuring the product's quality, and as such, you're better off developing your own.

By developing your own game, you demonstrate your ability and enthusiasm. By having the idea in the first place, you display creativity. By realising it, you show you have the ability and commitment to turn the stuff of schoolkid dreams into a finished product. By debugging it and turning it into something that people enjoy playing, you display an eye for the small details and a sense of what the market wants. Even a simple game, a 2D puzzle based on a tried and tested formula, requires initiative, talent and motivation to develop independently.

There are good reasons, aside from building a portfolio, for developing your own games. Indeed, there are independent developers who have no plans at all to move into the world of big name games and large studios. Independently-developed games can be sold. They can be profitable in their own right.

Now, let's be realistic. It's very unlikely you're going to make a career from selling a game you and a couple of friends developed over a few months. You've doubtlessly seen independently-developed games being sold and distributed online. Services like the Apple App Store and Xbox Live Marketplace will sell you games for less than the price of a pizza. And obviously the full amount doesn't go to the developer: a certain, probably considerable, percentage goes to the distributors. That's not the point, though. Some money is better than no money at all. By getting people to pay for a game you've created,



you're demonstrating to potential employers that your skills aren't just in C++ or 3D animation. Successfully marketing your product shows that you understand the gaming audience and have strong communication skills, which are a must in any job.

How do you sell a game?

There are a number of options available, each with significant advantages and disadvantages. The simplest and most accessible are software shops such as Plimus, ShareIt, RegNow and RegSoft. These websites allow you to host and sell your product in the one place. They keep a certain percentage, of course, but this is generally a small amount. Such websites typically don't provide any sort of marketing, at least not for free. All they are is a storefront. It's up to you to promote your product and convince the punters that it's worth their time and money. If you opt for this solution, pay attention to the fine print. Terms and conditions buried deep within the contract can sting you. A service may proudly promote itself as only taking a cut of 7 per cent, but there may be charges and ongoing costs they keep quiet about. Be careful.

If you know what you're doing, you could set up an online store on a website of your own creation and use a service such as PayPal to accept payments. Obviously, this guarantees

you get the highest percentage of the sale price of the product, but it requires a lot more work.

There are publishers that deal exclusively with independent developers. There are those which focus simply on turning your game into a 'packaged' product and there are those that go the whole hog and offer some sort of distribution service. Check out GarageGames (www.garagegames.com) and Oberon Media's I-Play (corp.oberon-media.com) service. The latter will allow you to promote your product on their website with demo versions and trailers. Well-received games are also given further promotion.

And then there are the specialised content distribution services. Independent games make their way onto Valve's Steam service. Independently-developed software, including a massive range of games, for the iPod and iPad platforms is sold through Apple's App Store. Independent games developers working with XNA can distribute their games through the Xbox Live Marketplace. Services like GameHouse (www.gamehouse.com) are akin to Marketplace, but typically more accessible in terms of entry requirements and for PC.

Distribution services such as the above have a very obvious advantage; they come complete with a large audience. Your marketing job is half-complete before you sit down and figure out how you're going to get Marketplace customers to find your product out of the many thousands of products available through the service. They



target a specific audience. In the case of the Apple and Microsoft distribution channels, they're the only practical way to reach the iPod and Xbox 360 platforms respectively.

The problems are more numerous. You will have to jump through many, unnegotiable hoops to get your game on to the App Store, Steam or the Xbox Live Marketplace. Expect to have to meet technical requirements and, perhaps, quality standards.

Many publishing and distributing services have fixed pricing models. Certain kinds of products are always sold at a certain price. Customers can only pay using certain methods. The publisher may only pay you using set methods at set times (say, once a month or when you earn a set amount). Be aware of the fine print.

How do you market your game?

With the prevalence of cheap software distribution services, finding a way of selling your game is simple and painless. If you're giving your game away for free, distributing it is even easier: find a web host with enough space and bandwidth and upload it.

If you've gone to all the work of developing a game, whether you opt to sell it or not, you presumably want people to play it. The problem is, you have a lot of competition. There are innumerable games available cheaply or freely

online. There are well-established sites and services, ranging from Yahoo! to Xbox Live Marketplace, which are obvious ports-of-call for anyone looking for low (or no) investment fun. Marketing your game can be very difficult. Large developers and publishers rely on teams of public relations staff with the ability to field and organise dealings with the gaming press. They have budgets that allow them to advertise in print, online or on screen. You don't.

First and foremost, you need a game people are actually going to want to play. Don't make your game available until you know that it's good. If it's arse ugly and riddled with bugs, it's not going to attract the punters.

Now here's something that may be surprising: a game that targets a specific audience is probably going to sell better than a game that tries to appeal to everyone. You should know your audience.

Drawing attention to your game can be difficult, depending on that audience. Forums are an obvious starting point, although keep in mind most online communities won't take kindly to newbies who pop up, promote a product and quickly disappear. The online modding and independent games scene is huge, though, and is a good starting point. Offering copies of your game to magazines and websites for review is a wise strategy, so long as you're confident that your game will be well-received. Exchanging links with and joining groups of other independent developers or mod developers is

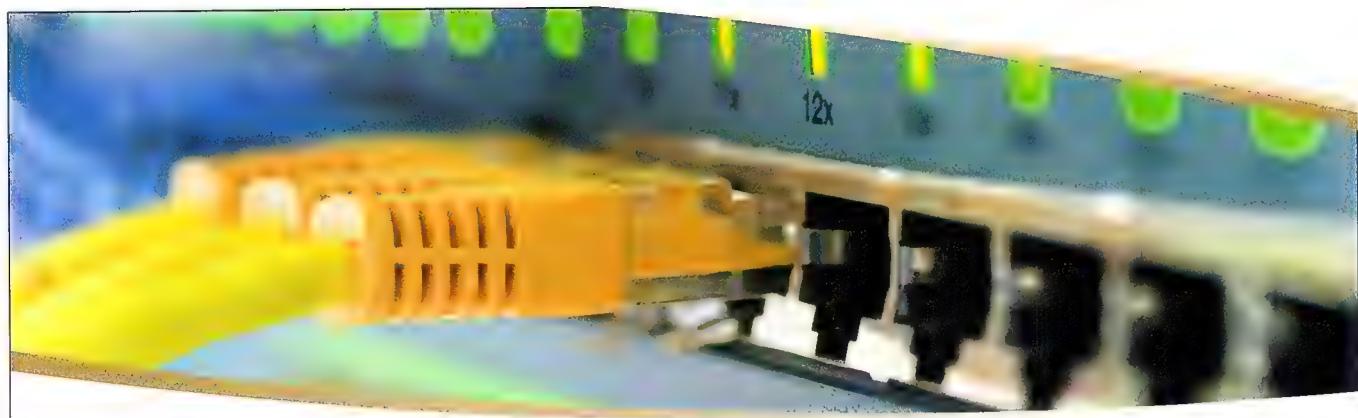


Shellblast by Vertigo Games.

also a good idea.

You need to have a demo available. If your choice of online store doesn't allow you to upload one, you have to host one on your website. Whether people come directly to your website after hearing a glowing review on an independent games development website or stumble across it on Google, you want them to come away with a copy of the demo.

On the matter of demos, make sure people who play it understand in what way it is different to the full version. If you've cut out features or set some sort of time restriction, make it very clear to the player – both via the website and in the game itself – this is what you've done. Make it clear what the final version contains. Finally, ensure that at the end of the demo, there is some information – a link wouldn't go astray – that will tell the player how to purchase the finished product.



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GAMES, GAMING AND FILM COVERED... ATOMIC-STYLE

We're putting so much gaming goodness out into the universe this month that we needed a whole extra section just to fit it all in.

But trust us: it's all killer, no filler. First up, an up-close and personal look at the history of Warhammer - from miniatures to massive multiplayer online adventures, it's all here and it's all written by someone who knows maybe a little bit too much about it ...

And if that's not enough, our Engine Room this month takes you behind the scenes of Warhammer's latest outing: Space Marine, and it looks good. Very good.

Last, but most definitely not least, we bring you the review you've been waiting for all year. Yes, it's here. Starcraft II. It very nearly caused us to completely miss our deadline this month, but it's here, and it is good.



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David Hollingworth takes you back to where it all began.

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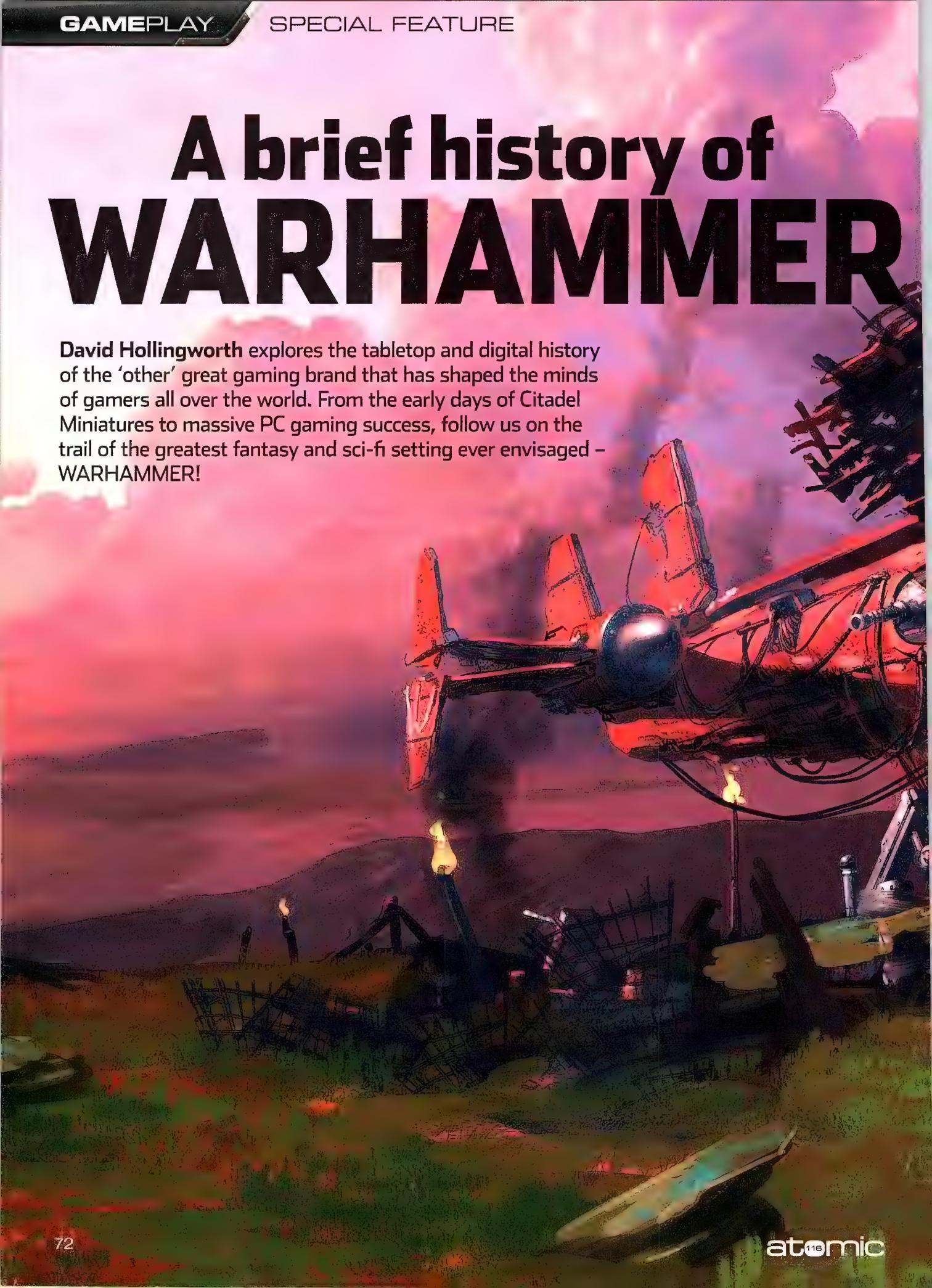
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A brief history of WARHAMMER

David Hollingworth explores the tabletop and digital history of the 'other' great gaming brand that has shaped the minds of gamers all over the world. From the early days of Citadel Miniatures to massive PC gaming success, follow us on the trail of the greatest fantasy and sci-fi setting ever envisaged – WARHAMMER!





You may not know it, but 1983 was a pivotal year in gaming. To give you a bit of perspective, that was the year that both Bob Hawke and Margaret Thatcher were elected to power. It was the year we won the America's Cup, and the first time the Global Positioning System was made available for public use; the GNU Project was also first announced in 1983. The Red Hot Chilli Peppers released their first album. The

Cold War was still on, the IRA was still setting off bombs, and *Return of the Jedi* proved a smash hit in cinemas.

But more importantly to gamers everywhere, and of every stripe, is the release of the first edition of Warhammer Fantasy Battles, a tactical rules system for fighting epic conflicts between armies of fiddly metal models.

Nearly twenty years later, that simple set of rules has spawned a billion-dollar gaming

industry covering wargames, RPGs, novels, and even (soon) a CGI film – not to mention a raft of computer games on everything from PC to Sega Saturn. With *Dawn of War* now a household name, and Space Marine soon to truly show off the awesome brutality of the Warhammer 40,000 universe in all its intimate glory, we track the history of this gaming phenomenon from its humble beginnings to the dominating position it sits in today.

Humble beginnings

Formed in 1975, Games Workshop didn't get up to much for the first few years – there wasn't even a hint of the kind of fantastic creations that were to come. Instead, the company made wooden boards for traditional games like chess and backgammon. Hardly inspiring stuff, but if you're at all a student of pen and paper gaming, two of the three founding members should ring a bell – Steve Jackson and Ian Livingstone.

John Peake was the third founding member, though he left the company after only one year. Peake was the more traditional of the three founders, so his departure allowed Jackson and Livingstone to instead focus on a new and more esoteric side of gaming – roleplaying.

Steve and Ian

If you were an avid devourer of anything gaming and fantasy related in the 80s, then you most certainly played or read the *Fighting Fantasy* novels. These single player, choose-your-own-adventure style books were some kind of gateway drug for gaming geeks. And they were the brainchild of Steve Jackson and Ian Livingstone.

Both have since gone on to make it in the computer gaming industry. Jackson (not to be confused with the Steve Jackson of GURPS and *Car Wars* fame) is the co-founder of Lionhead Studios alongside Peter Molyneux, and Livingstone's currently the Life President of Eidos Interactive.

See? Playing with dice and reading can get you places!

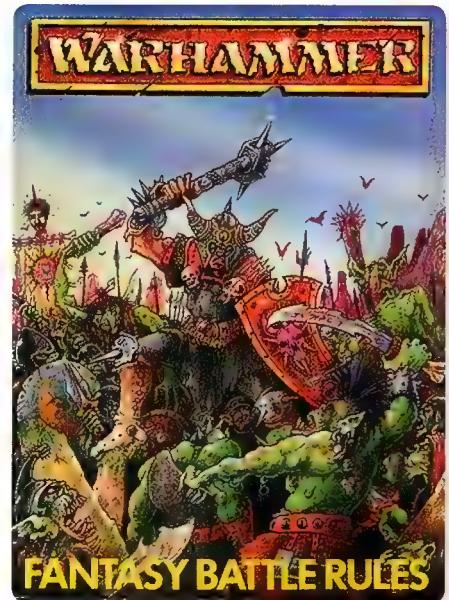
Games Workshop, in those days, had a licensing deal to distribute *Dungeons and Dragons* in the United Kingdom. *DnD* was a very different beast back in those days, but it was still popular – so much so that Jackson and Livingstone were able to run conventions, publish a newsletter-slash-magazine on their hobby, and eventually open the first Games Workshop store in the heady days of 1978, a year after the first published edition of the GW magazine, *White Dwarf*.

In 1979, GW helped set up Citadel Miniatures to produce 25mm scale fantasy figures for the growing RPG and wargaming market, but otherwise, GW's bread and butter was reprinting other company's games – notably *Call of Cthulhu*, *Traveller* and *Runequest*. Through to 1983, Games Workshop didn't publish any of its own material outside of *White Dwarf*. Along with *Dungeons and Dragons*, these are still some of the biggest and most popular titles in gaming today, so that should give you an idea of the kind of success a company could have reprinting their material.

In fact, it's not a huge stretch to say that Games Workshop directly helped those games get where they are today.

While not a property the company owned, GW published original roleplaying systems based on popular properties such as *Doctor Who* (the original Doctor Who series, of course!) and some of the classic comic series produced under the banner of cult favourite publisher 2000 AD. Games Workshop produced a *Judge Dredd* RPG, as well as a mess of colourful boardgames. These were produced well into the late 80s.

In tandem, Citadel Miniatures also had the rights to produce licensed miniatures. However, it's a business truism that you only make real money with original intellectual properties, and in the early 80s Games Workshop was about to hit paydirt.



I hit it with my Warhammer!

To say that the world of Warhammer is a pastiche is an understatement – it's one of the *ultimate* pastiches! The first edition of the game, which Games Workshop produced in 1983, was more or less setting agnostic, but as edition piled on edition the world slowly took shape; formed and influenced by the games, novels and films beloved of the game's writers.

The nation-states and races of the Old World (Warhammer's setting) were a mixed bunch. You've got a mess of human states, based on everything from Renaissance Germany to High Medieval France, a number of Elven nations that are the usual mix of Tolkien tropes, with the addition of an evil faction of Dark Elves, and





of course Dwarves – who are similarly derived from Lord of the Rings and just about any other fantasy setting. There's Orcs, Goblins and Undead, including Eastern European Vampires and Egyptian-styled Mummy Kings. There's even this whole Arthurian thing thrown in where the founder of the Empire (the human Germanic faction) promised millennia ago to return to aid his people should he ever be needed.

However, there's one author that, more than any other, shaped the way Warhammer developed – Michael Moorcock.

Moorcock's most well known fantasy work is the dark character of Elric; the dour, albino, magic-sword-wielding hero of one of his most popular series. To say Moorcock was fond of the old anti-hero is putting it lightly – he's well-known for hating the more heroic side of fantasy, and was often quoted as hating the works of Tolkien. One thread that ran through many of his novels – which are nearly all interconnected in one way or another, thanks to his uber-setting of the Multiverse – is that of Chaos, an elemental power seeking to overthrow all of ordered creation.

And, in Warhammer, we have Chaos in all its trappings. Even the eight-pointed Chaos star, beloved of Warhammer gamers and death-metal acts the world over was first envisioned by none other than Moorcock.

But to say that Warhammer is merely just the sum of its parts is to do it all a great disservice. It's far, far greater, in fact; and in terms of pastiche, it's worth remembering that Tolkien himself drew inspiration from sources as disparate as The Bible and Old English myth cycles.

What the creators of Warhammer Fantasy and its sci-fi spin-off Warhammer 40,000 have managed is a three-fold success. Firstly, their worlds are both boldly written, but infinitely rich in depth. At their simplest they're full of tales of evil wizards and mighty heroes casting them down, but burrow a bit deeper and you'll

find disturbing tales of corruption and intrigue that are almost Lovecraftian in their palpable creepiness.

Secondly, they've invested in some of the best artists and designers in the world. Warhammer is, above all, a visual medium and you'll find in the pages of any Games Workshop product art that's as good or better than any other gaming product. Little wonder it's so easy for companies like Relic to then convert Warhammer into striking computer games.

And thirdly, Games Workshop knows how to create and evolve a game system that's fun to play whether you're twelve or 42.

As it turned out, despite their knowledge of computer gaming, they had long thought that wargaming was all about spending hundreds of hours painting up a beautiful army – and then throwing rocks at it. In short, they thought it was no different to what kids do in sandpits.

Suffice to say that's not how it works at all.

A game of Warhammer is more like creating a living, evolving diorama. There'll be terrain, from buildings and forests to rolling hills and immaculately re-created rivers – all painted up and modelled in as much detail as the armies themselves. At the game's beginning players set up, according to each scenarios rules, then the game progresses with a series of turns.

In each turn you move, shoot any ranged units, deal with melees, and then handle the aftermath of any fights – all managed with the roll of one or more (usually a LOT more) six sided dice. Or D6, in gamers' lingo.

But pushing toy soldiers around your kitchen table is just one part of the Warhammer hobby.



The game itself

First up, a minor admission – we love Warhammer. We've wargamed, roleplayed, painted up entire armies (like the Commissar to the right), and filled entire bookshelves with rulebooks, army lists and expansions. So, for us, the way a 'proper' RPG or wargame works is second nature. But it's not that obvious to some.

Case in point: upon showing a curious co-worker some of the figures we'd painted (and yes, there are some in this very article!), they tutted and said "I just don't know how you can put that much detail into them and then play soldiers." Curious, I asked what they meant.

A wider Warhammer World

A lot of Warhammer hobby is kind of... internal. You sit at home, reading and learning the rules. You hunch over your figures, painting away in solitude for hours. And most games involve only one other person – to a lot of people, it might seem a very solitary, limited hobby.

But the reality is very different. The Warhammer hobby is actually very socially oriented, and involves a lot more than just the game.

Truly social gaming

Right from the now-distant days when Games Workshop opened its first store in the seventies, and was involved with the burgeoning gaming convention scene, the company's understood that to truly succeed it had to harness the social side of the hobby.

The biggest events that Games Workshops runs draw thousands of gamers, and they are held all over the world – even here in Australia. Games Days, as they are called, feature competitive tournaments, talks from writers and artists, sneak peeks of upcoming products, and displays of miniatures and terrain designed and painted by the best that GW has to offer. They're all day events, not unlike our own Atomic LIVE or Power to the PC tour, that celebrate every aspect of the hobby, and an important part of that is sharing it with others – whether you're there to play the game, dress up as your favourite character (yep, there are Warhammer cosplayers every bit as serious as their anime counterparts!) or just want enjoy the whole experience.



Aside from the official events, there are many fan-based leagues and ladders as hardly fought over as any *Counter-Strike* match – and unlike a lot of computer-based competitive gaming, having actual fun and being gentlemanly about a game is a core concept.

Online there are also many community-based sites and forums where like-minded modellers and gamers get together to compare armies, discuss the finer points of the rules, or even write their own fiction. A personal favourite of ours is www.warseer.com, a longstanding community that boasts members from all over the world, whose larger threads are now starting to run to over 400 pages – and you thought the Atomic forums were active!

Expanded universe

Like any good franchise, the world of Warhammer transcends most bounds of media. The games, since the early editions of both Warhammer and Warhammer 40,000, have always been as much about well written fiction as they are table-top action. Called 'fluff' by the fans, the rules are full of histories, biographies and stories set in the Warhammer world.

Back before White Dwarf was a purely in-house magazine, a prominent author (and weapons physicist – go figure) named David Langford wrote a SF literary criticism column, and it was around then the first novels set in the Games Workshop worlds were written, and often

A day at a tournament

Wonder what goes on at a Warhammer tournament? Well, it's a wonderful celebration of gaming, and not all that different to a big LAN. You take your army along, meet other gamers, and do your best to win!

They range from small affairs made up fo a few mates, to hundreds of gamers filling vast halls. The pic to the right is from Games Workshop HQ in England, and you can even see the themed walls and furniture.

A tournament works kind of like the Soccer World Cup. In the early stages, it's a random draw for who you play, and on what table/terrain. Each player scores points based on winning a game, achieving a certain objective, or even just for being a good sport.

In the final stages, to make sure the best players play off against one another, the matches are often paired based on your score so far. So, the number one and number two players pair off, so do three and four, and so on. And thus, a winner is found.

On the day there'll also usually be awards based not just on clever play, but on best-painted army, good sportsmanship, and maybe even a wooden spoon award.

And then you go to the pub.



And a movie?

If there's one thing that fans have been wanting to see for years, it's a movie based on either the Fantasy or 40,000 game worlds. There have been movie projects that have stalled, the odd fan project that's either too low-budget to satisfy or has been shut down by GW's rigorous control over its IP, but until last year, it just wasn't happening.

In 2009 Games Workshop announced that Codex Pictures was producing 70 minute CGI film called *Ultramarines*. It's written by arguably the best of the Black Library authors, Dan Abnett, and will feature some serious voice talent – John Hurt, Terrance Stamp and Sean Pertwee to name a just a few of the cast.

It's not going to see a cinema release, but will instead go straight to video – but we're still very keen to see this film.

The Ultramarines, incidentally, are the same chapter as featured in this month's Engine Room featured game, Space Marine.

terms, it's a fiendishly successful publisher of novels, comics and short story collections. There are over 200 Warhammer novels in print, and more published each month. What's more, The Black Library has also moved into mainstream SF and pulp publishing.

Admittedly, some of the works are not exactly threatening more literary SF authors like Neal Stephenson or Iain M. Banks, but there's some good stuff on offer for a Warhammer fan who has a desire to delve even deeper into their favourite worlds.

And for those who want to delve deeper and nerdier still, there are roleplaying games as well – *Warhammer Fantasy Roleplay*, which has just had its third edition published, and the more recent *Dark Heresy* and *Rogue Trader* RPGs, set in the Warhammer 40,000 world. Like a computer RPG, in these games you don't control whole armies, but rather take on a more specific individual character – and again, these are inherently social pursuits.

And speaking of computer games, there have been a whole lot of those...



involving reasonably well known writers of SF, like Ian Watson, but the real Warhammer publishing boom came with the creation of Games Workshop division called the Black Library.

In 40,000 terms, the Black Library is an alien repository of forbidden knowledge. In publishing



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Pixelhammer

The first computer games Games Workshop published were written for the ZX Spectrum, and were nothing to do with Warhammer, but it's interesting to discover just how long GW's been in the gaming space. There were a mess of boardgame conversions, including *Apocalypse* and *Talisman* (itself a well known GW property), and even more text-based adventure games: *Ringworld*, *Journey's End* and *The Key of Hope* to name but a few.

However, there have been even more games set in the Warhammer universes – not all of them, though, have exactly been hits...

Games Workshop is a company that is very careful with its intellectual property and how it licenses it, so it's really surprising just how bad some of its computer game efforts have been. These have largely been produced out-of-house and not actually by GW, so perhaps it's taken the company a while to work out just how to say "no!" when a developer tries to peddle crap to the market.

Arguably the most perfect case in point is *Fire Warrior*, the much lauded and somewhat anticipated 40k FPS.

You're doing it wrong

So, imagine you're working on the first First Person Shooter produced for a Games Workshop property. It's set in the violent and war-torn Warhammer 40,000 universe – full of dark aliens, evil chaotic (or is that chaotic evil? Oops, wrong game) threats and bold, mighty heroes. The lines between good and evil, often blurred, are pretty damn plain – humanity good, the rest of the universe a Godless mass of things that just want to kill us or take our planets. This is a game with arguably one of the most iconic of heroic types – the power-armoured Space Marine. If that's too lofty, you



could also work with the more approachable everyman of the 40k universe, the humble Imperial Guardsman.

But no. You instead decide to make the campaign's playable race and the player's vantage point of the game the newest and least Gothic race in the game – the Tau. And you decide to make the Imperium the badguys.

Which is why, today, search for Warhammer 40k on eBay and not only will you find the usual array of folks selling spare figures, rulebooks, or entire painted armies, but also vast quantities of Fire Warrior.

It's the kind of game so bad that fans pick it up to enjoy ironically, like the infamous Atari ET game, but honestly it's not even worth that.

Fire Warrior is an admitted low point, but Warhammer titles, for all that the universe is just so rich and full of great game ideas, have seemed to languish in mediocrity. There have been lots of games that the fans like, but nothing – until recently – that's really managed to bridge the gap between the guys who own a dozen armies to the more general computer game playing public.

Just good enough

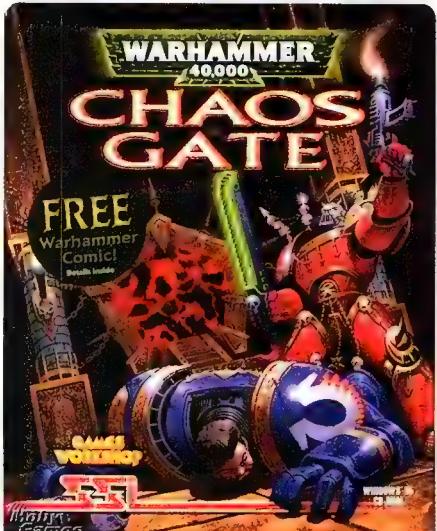
Two games, for us, really epitomise this 'good for fans' approach.

Final Liberation was an epic PC wargame where you controlled entire armies of soldiers. It was, unsurprisingly, based on the Epic version of Warhammer 40,000. You not only controlled companies of soldiers and squadrons of tanks, but even mighty, building-sized war machines like Titans and Ork Gargants.

It was ambitious, and, like many ambitious games, a little too deeply involved in the 40k mythos and setting to really appeal to a

wide audience of gamers. Similarly, while the graphics did what they could, they were still largely far less inspiring than the 6mm scale (this is Epic after all!) figures the tabletop game was based on.

The same issue plagued *Chaos Gate*, an isometric, squad- and turn-based strategy game that I've personally played an awful lot of. It was a more approachable game, being more or less on the same scale as main 40k game, and featured two of the most iconic





Warhammer 40,000: Rites of War.

protagonists – the Ultramarines and the forces of Chaos. The game itself used a *Jagged Alliance*-style turn system – each character on screen had a certain amount of action points to move and shoot with, and you go from unit to unit until either acting or going onto overwatch, before the other side took its turn.

It was a lot of fun, but still didn't quite have the visual appeal of the actual game, and the



limited gameplay and unit options didn't help much either. It did, however, have the most galling of all Quit screens we've ever seen in gaming – every time you exited to Windows, the following question came up:

"Betray the Emperor – Yes or No?"

A proposition that no right-minded supporter of the Imperium could ever truly answer 'yes' to. Man. We played a lot of Chaos Gate, purely out of Imperial Guilt.

Our fond, admittedly blackmailed memories of Chaos Gate even led us to invest probably more time than we should have into the PSP title *Squad Command*, which, again, pitted the Ultramarines against the Forces of Chaos.

Warhammer Fantasy has had its share of games, from the massed battles of *Dark Omen* and the more recent *Mark of Chaos*, to the MMO *Warhammer Online*. However, none of these have really set the world on fire. When you translate the wargaming side of Warhammer Fantasy into a computer game, it really doesn't compare at all well to actual strategy games – especially when you try and replicate mechanics that are designed



Shadow of the Horned Rat.

for a turn-based tabletop game. Similarly, taking the RPG elements of Warhammer and turning them into an MMO – one that lost two thirds of its promised content before launch, haemorrhaged players, and featured an interesting yet ultimately restrictive progression system – which simply left the fans of the tabletop RPG wondering where they'd left their percentile dice and MMO fans wondering if they could re-activate their WoW subscription.

It would take a radical re-thinking of how to bring Warhammer to computer gamers to give the setting its breakout. Thankfully, that's exactly what Relic Entertainment was able to do with *Dawn of War*.

A new dawn

Relic Entertainment's Dawn of War was at the center of a confluence of events so auspicious that the God Emperor of Mankind himself might have foretold it.

First up, Relic had an excellent relationship with Games Workshop, and in turn GW did no more than guide production of the game. They essentially provided the background and IP, then sat back and let the video game makers do what they do best. And the fact that Relic has a proven track record with great strategy games didn't hurt either.

The *Homeworld* series was a space-based RTS that turned the genre on its head with full 3D gameplay. It looked great, played superbly, and was that rarest of things – an innovative strategy title.

Sure, Relic's next game – *Impossible Creatures* – wasn't as successful, but it still had that crucial spark of originality.

Dawn of War's scale was just about perfect, ably reflecting similar-sized fights that seasoned table-top players would be accustomed to. It was a familiar take on the universe, and what's more, it focused on the right troops – in the singleplayer campaign you take on the role of the Blood Ravens, a Space Marine chapter. Beats the hell out of Tau!

On top of that, the other races in the game were some of the oldest and most iconic – the Eldar, Orks and Chaos. They also offer very different gameplay styles, so already looking at that mix you've got a game moving in the right direction for success.

Change the game

In the past, a lot of Warhammer games, especially 40k games, have seemed to be genre explorations first, and games second. With Dawn of War, Relic did what it does best and completely revamped the way an RTS match flows and develops. Resources weren't mined – they were taken as you took territory. This forced a fast and aggressive style of play that focused players into head on combat, while still allowing for sneaky stealth tactics.



Expansions were deftly handled too. Each one added new races, updated old ones with new units, and usually added whole new gameplay elements, like the region-based non-linear campaign in Dark Crusade.

Even better, these expansions could be played without the original game!

Dawn of War rates 86 per cent on Metacritic today, but you can't measure the game by its success alone. Relic took the objective-based gameplay of DoW and ported it into that most well-worn of settings, World War II, for its *Company of Heroes* RTS.

If anything, CoH improved upon and bested the gameplay of Dawn of War, but the game would not be around were it not for the grim darkness of the 41st millennium.

A new dawn... again

When Relic released *Dawn of War II*, it again took the game in a very different direction, and if anything, got even closer to everything that makes Warhammer 40,000 so great. Many complained about the length of singleplayer campaign in the original, but Relic used a lot of what it had learnt from Company of Heroes and

the original DoW expansions to bring another unique game to market.

The unit sizes were smaller, and the focus on actual named characters far greater. The campaign was also much more about choice, giving players many ways to prosecute and influence the campaign to retake a swathe of Imperial planets.

More importantly, the game did away with base-building entirely (which never really quite fit the 40k universe), and added an experience system to upgrade characters





and squads, with an RPG-style loot system for equipping your Marines.

The first expansion for the game, *Chaos Rising*, adds... well, you can surely guess. But as good as Dawn of War II is, we feel it's being eclipsed by two upcoming 40k releases.

A wider world

We've not only got another Relic 40k title coming... some time, most likely next year, but Vigil, the team behind THQ's recent *Darksiders*, is working on a Warhammer 40,000 MMO called *Dark Millennium Online*.

This could be big. It's never going to get the same numbers that World of Warcraft has, but there's every reason that a 40k MMO should be the perfect game. The rich setting is full of combat and conflict, riven with factions and intrigue. There's a mess of races, each with unique abilities and class structures.

Dark Millennium Online was more or less on show at this year's E3, but there wasn't a lot of game to see. We're a long way out from seeing anything we can fairly judge of course, but for the moment that game seems to taking a slightly more colourful and frenetic approach to Warhammer.

That said, we did get a brief chat with David Adams, Vigil's General Manager. We didn't get a lot of specific game info, but he did show off an impressive amount of knowledge of the world of 40k – he's even a veteran of the game's first edition! So it seems the game is in the hands of people who know and respect the IP.

The other big game is *Space Marine*, and you can read a mess about that in our exclusive Engine Room preview in just a page or two. And it's worth reading about – we're stupidly excited by the prospect of a third person shooter where you get to play as one of the mighty Astartes, and even more excited about being able to break the news that it's going to be released on PC (!!! -ed).

However, specific games aside, it seems that Games Workshop has found a video gaming partner in THQ that can live up to their high ideals, and consistently translate Warhammer – or the Warhammer 40,000 at least – into quality titles.

Age of Reckoning, EA's Warhammer effort is seeming more and more like an incongruous hiccup. As long as THQ and Games Workshop can each leverage their individual talents, we expect many more great games to come. (EP)

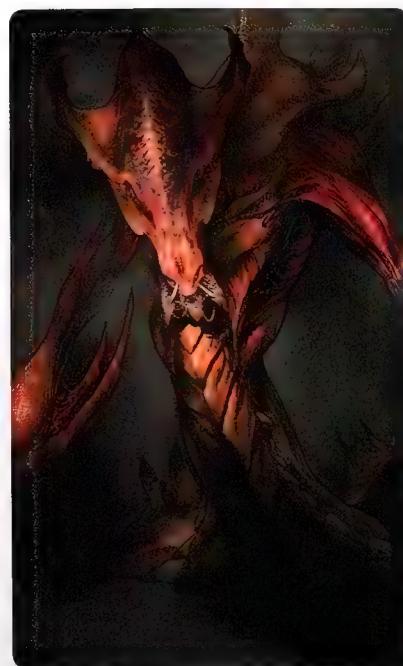
Under the influence



The Warhammer world would not exist without the many other works of fantasy and science fiction that have inspired it. We've already touched on how important the works of Michael Moorcock were to the setting's original writers, and there are many other strong influencers – the works of Hieronymous Bosch, HR Giger, and other novels like *Starship Troopers* and *Dune* are all in the Warhammer DNA.

But it's fair to say that Warhammer's pastiche has now become an influence in its own right.

There have been many games (both tabletop and computer) that have taken a leaf from Warhammer's well worn pages,



but arguably the most interesting case is that of Blizzard Entertainment.

It's a popular story online that Games Workshop was working with Blizzard on a Warhammer RTS back in the early 90s. The story goes that GW pulled out of the project, leaving Blizzard with a more or less complete game – no one knows the specifics of the deal, but Blizzard released *Warcraft: Orcs and Humans* soon after. When you compare the settings, even including more recent Warcraft release like WoW, there are huge similarities.

There are even more similarities between Starcraft and Warhammer 40,000, especially the Space Marine units and the Zerg race (a near spitting image of 40k's Tyranids).

However, while this can often be a matter of huge nerd rage online – including some younger gamers who consistently say GW is ripping off Blizzard – the truth is that both companies deliver outstanding products, with unique and compelling content. Sure, Warcraft's art style is a little reminiscent of Warhammer's, but at the end of the day both companies have managed to take their inspirations and make something worth playing on its own merits.



And they shall know no fear

David Hollingworth got a sneak peak of the next Warhammer 40,000 game, Space Marine, and very much likes what he saw...

The grim dark future of the Warhammer 40,000 universe is no stranger to our PC screens. Games of every scale have been set in Games Workshop's fanciful pastiche of sci-fi tropes, from epic strategy games to claustrophobic corridor shooters. Until Relic's relatively recent foray into the Dawn of War games, 40k, as it's known to its fans, has never really been a mainstream hit with computer gamers, but that's all changed now. DoW has gotten a tonne of critics awards, and Dawn of War II currently has a Metacritic rating of 85. But for all that the setting's now a hit, there's never been a 40k game like Space Marine.

Following E3 in June, THQ flew us up to sunny Vancouver for a visit to Relic's studio to get a sneak peak of how the game's shaping up. Just walking into the office you know these guys are serious – the eight foot tall faux stone statue of a marine is one giveaway, and the lifesize and lifelike suit of power armour in the other corner of reception is another.

But when we sat down for our demo, we got a true sense of just how excited the Relic team is about Warhammer.

The right team for the job

The current crop of devs working on a game are like a who's who of the industry. Not only are there Relic veterans from the Dawn of War series working on the game, but the company's sought out talent from the likes of EA, Ubisoft,

Rockstar and even Microsoft. These are some serious industry heavy hitters who get gaming on a deep level, and what's more, they're loving the game they're working on – always a good sign!

"What we have building this game," said Andy Lang, one of the producers at Relic, "is a really



Special and more powerful weapons like the Heavy Bolter will be balanced by having limited ammunition.



passionate group of people, who love Space Marine, and really love Warhammer 40,000." In fact, more than once during our time in the studio and chatting with the Relic crew the subject of their tabletop armies would come up. These guys are really living and breathing the hobby. They get the game's subject matter on a deep level – and we say that as passionate 40k fans ourselves.

"The Warhammer 40,000 universe is a lot like the Roman Empire," another producer, Raphael van Leirop explained to us, "you've got this expanding power in the shape of the human Imperium, spreading out into the galaxy and finding out about the alien threats out there." It's an interesting historical analogy, and apt, too. "And so you've got all these alien threats pushing

"What we have building this game ... is a really passionate group of people, who love Space Marine, and really love Warhammer 40,000."

back now, and really, humanity's now on the edge, and there's only one thing that stands between the Imperium and extinction – the Space Marines," he goes on to say – giving us goosebumps, incidentally, but we're nerdy like that – before adding: "Like the famous Games Workshop saying says, 'In the grim darkness of the far future, there is only war'."

"And this is the world we're bring you into in Space Marine."

An epic tale

Space Marine takes place on a forgeworld, a heavily industrialised planet that is essential to maintaining the armies of the Imperium. It's been invaded by an old foe – millions and millions of Orks, dropping out of the sky on commandeer asteroids and clumsy but effective starships. The planet's been over-run, the local Imperial Guard – laughably referred to by 40k players as normal dudes with t-shirts

Moments of the game are full of dramatic moments, like swarming Orks with shields rushing you to protect their less armoured companions.





and flashlights, to give you an idea of their comparative effectiveness – has been slaughtered, and now the Orks are controlling the forges.

What's worse, this is one of the rare Forgeworlds that builds the largest warmachines of the Imperium. "And if they should be destroyed, or – even worse – captured by the Orks, it's serious bad news," said Raphael.

The only force capable of taking back the planet, and doing so quickly, are the Space Marines of the Ultramarines chapter, the elite of the elite, who immediately drop onto the planet to secure the most important tactical objectives before turning to wiping out the green tide of Orks. "That's the situation at the start of the game, and that's the situation you're dropping into."

And that's when we finally got to see some actual gameplay. We were shown three clips in total, from very different phases of the game.

First up, we saw what happens when a bunch of jetpack-equipped Orks try to board an Imperial flying craft with a Marine on board – nothing good! Essentially, you're the lone passenger on transport, one of dozens flying into a combat zone, when the Orks attack – as they swarm over other flyers, you've got to take to a mounted heavy weapon to blow them out of the sky.

As a first taste of combat, it's brutal. Bodies tumble and jetpacks burn and explode. Clean hits from the explosive rounds of your bolter splatter gore and limbs in a cloud of carnage. When the

What is a Space Marine?

Adeptus Astartes. Angels of Death. Space Marines.

The elite super soldiers of the Imperium of Man go by many names, and come from many chapters (semi-monastic military orders), but they all have one thing in common – they kick major butt.

They are genetically modified, armed with the best equipment the Imperium can forge, and loyal to the point of death. According to the deep and at times complex background of the 40k universe, when the Emperor of Humanity decided he needed an elite cadre of warriors, he created the Primarchs, 20 superhuman clones of himself with enough drift in their forms to be independent and unique. From the Primarchs came the geneseed that is implanted into each acolyte Marine, and in turn boosts their muscle growth and bone density, mental acuity, resilience, and lifespan.

With you playing one of these Angels of Death, Relic's gone to great pains to understand what makes a Marine tick.

"Marines are a really interesting collection of warrior archetypes," Raphael told us. "They're bound by honour like Samurai, serious and devout like knights and steeped in their own mythology, and disciplined like the Roman legions – expert tacticians on the battlefield."

"They're also relentless, like the Spartans, and they will never stop or give up," he said. "They are the pinnacle of 10,000 years of warfare, and this is the role you get to take in Space Marine."

Can we play now, please?



As a first taste of combat, it's brutal... Clean hits from the explosive rounds of your bolter splatter gore and limbs in a cloud of carnage.

fixed weapon runs dry, the Marine switches to his standard weapon – a bolter – and uses that. It's not as devastating, but still an awesome weapon. We blast away not only at individual orks, but at whole Ork ships, kruisers (Orks spell like that!) that are reminiscent of the Reaver ships from Firefly – all jagged metal and red paint. Each kruiser is swarming with Orks waiting to leap from their ship to yours – until you blow them out of the sky.

But the torrent of incoming fire is overwhelming, and our flyer eventually crashes into an Ork-held section of the vast industrial city. On foot, we get to see the main action of the game, and some melee combat. Switching from bolter to chainsword is smoothly animated, as are the directed attacks once you're inevitably surrounded. A few strikes can kill an Ork, plus there's a range of one-on-one fatalities that see you cutting bodies in two and almost literally wading through death.

Three things are immediately apparent. First, while the action is all third person, like Gears of War, the game does not feature any kind of sticky cover system. "We just didn't feel that a super warrior in power armour would need to use cover like that," said Andy. There are stacks of crates and low walls to stand or crouch behind, but that's it.

And a lot of that cover is destructible, so the action will always push you on and forward.

The other thing we really got was the sense of power of the Marine. Like in Arkham Asylum, the default move is not a run, but rather a steady trot. You can sprint, but otherwise you get this incredible and quite stately sense of weight. Combined with the resounding tread of your armour, the game has a very deliberate pace.

Finally, there's no health system. As in many modern games, there are on-screen blood effects to show you're taking damage, but all

you need to do is get out of direct fire and you'll regenerate – much like Halo. We asked Andy about that.

"We've been playing with a lot of different ways of doing health," he said, "but right now, we're showing damage with splashing a lot of blood on the screen, to show you're being hurt. Get into cover, and you'll be fine." The other important visual cue to how hard your Marine is is the amount of rounds and ricochets that bounce off your armour before those blood-cues start to show up. The game really seems to be owning that feeling of being an unstoppable warrior knight.

In the first scene our Marine is by himself, but in the second sequence we're joined by a squad of other Marines. So far, squad AI is looking



Advancing your Marine

Like many modern games, advancing your on-screen character is going to be an important part of the Space Marine experience.

However, instead of having the game be skill-based, you'll be levelling your weapons and gear instead. "All that's going to be weapon-based," Andy Lang told us, "with each weapon getting better the more you use it – there'll definitely be some special things in that system." The game will essentially reward you for playing exactly how you want to play.

Even cooler, your gear will change to reflect this system of upgrades, so that by the later stages of the game you'll be looking like an epic hero. And looking at a lot of the posters and artwork around the Relic studio, we're guessing that gear like targeters, scopes and combat blades are going to be a part of the upgrade system.

capable and solid, able to support you and score kills independently.

We also got to see quite a few weapons, though not everything. Bolters and Heavy Bolters fire off explosive ammunition, plasma guns fire balls of energy that can evaporate enemies, but the weapons themselves are prone to overheating, and there's a range of grenades. The only melee weapon we saw was the chainsword, but we've been promised there'll



be heavier items like power fists and thunder hammers to play with.

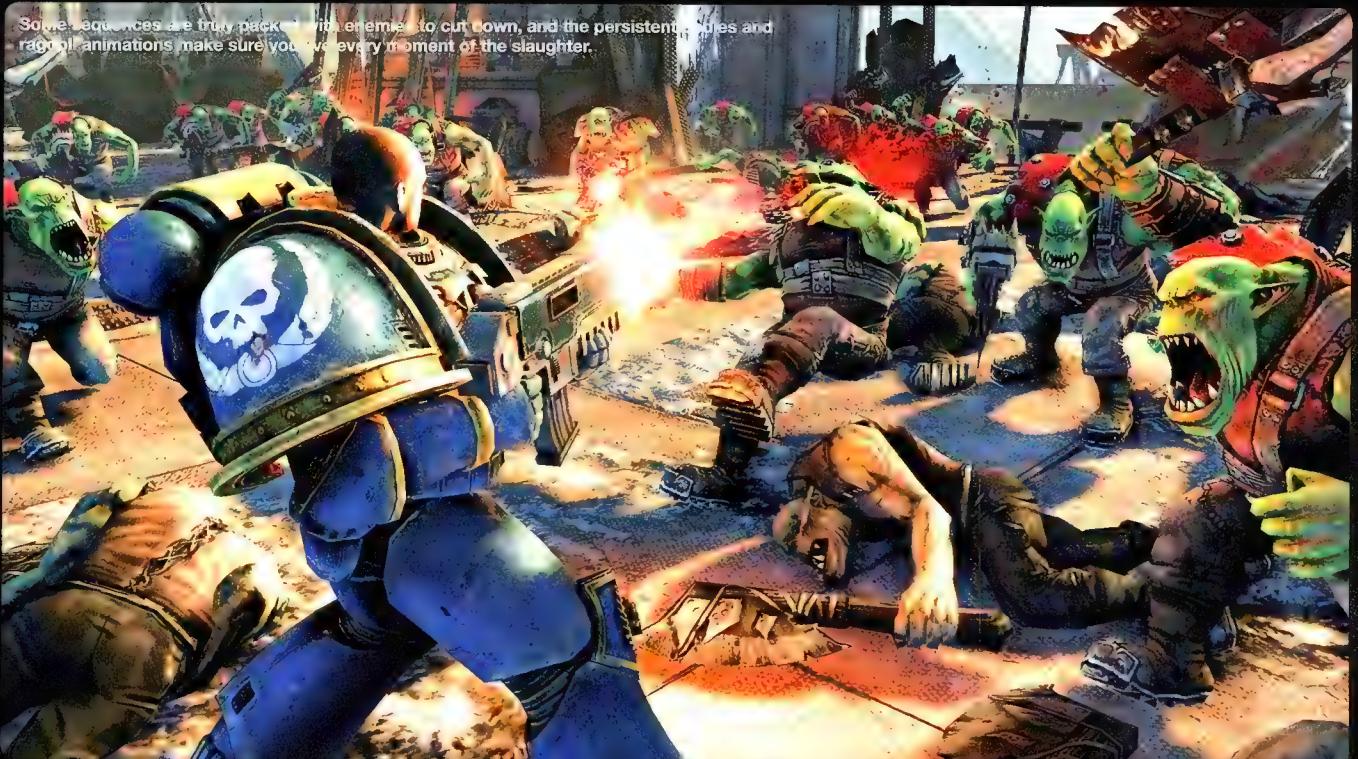
These more exotic weapons will be balanced by requiring rarer ammunition, and so you'll often be falling back to your basic bolter. Run out of ammo for that, and there's always your bolt pistol, which has unlimited ammo – you'll always be able to shoot that last Ork.

And speaking of squadplay...

Relic wasn't really keen to talk much about multiplayer with the game still so far from finished, but we had to ask anyway – especially given that the game menu we saw before the demo featured a Co-op option.

"We're not really talking about that right now," Andy demurred, "but, to be honest, we're Relic, and we like to deliver good multiplayer games. It's one of the things we do well." So we're guessing that, yes, you'll be able to play the game in co-op mode with a squad of mates. Based on the single-player stuff we saw, multiplayer will be about ten times more awesome.

Even awesomer for PC gamers is the news that Relic's keen to bring the game to PC, not just consoles as initially announced. "Well, we're aiming for a same-day PC release – we're not promising it, but it's what we want," Andy admitted. "Relic's a PC company after all, so it makes sense. But we're still working on just what that means for the PC version." Which is





The giant armoured monstrosity here is called a Killer Kan, and we're guessing it's one of the game's bosses.

great news indeed, but what about the nature of the port, and what that means for graphics and control optimisation?

"It will definitely have a PC-optimised control scheme," he said. "We're not going to release anything that feels terrible with a mouse. But as to the engine side of things, we're not sure about that; AA or AF? Who knows. Are we going to go two or four up on the textures? Again, we're still working on that."

Hopefully Relic will work it out in PC gamers' favour – this is already a very pretty game to look at, with one of the most epic lighting engines we've seen and some subtle volumetric effects. It would be shame to see a grunty gaming rig not be able to take full advantage of it. But at least we know the team's passionate.

"You know," Andy told us late in the day of our visit. "We're often really nervous when we show stuff to press, but we're just so excited about this. It's a game that we want to show off."

And we can't wait to let them.



Like any Games Workshop game Relic's produced, Space Marine features some awesome art.

MODIFICATION

with Ashton "That's no moon.. it's a MOD!" Mills



CSS SCI FI 3: Hardwired 3.02

Game Half Life 2

URL www.amphibian.myzen.co.uk/css_sci_fi

This is a mod that guarantees a good return of investment. Well, it's free, so even five minutes of gameplay would be a good return, but CSS SCI FI 3: Hardwired (lets just call it Hardwired henceforth) delivers an epic 42 levels of singleplayer gameplay, and in an environment you know like the back of your hand, foot, ears, eyes, nose hairs and your very blood: Counter Strike.

Wait, did I say single player and Counter Strike? Yes indeed gentlemen and gentlewomen! Imagine all the classic maps from Counter Strike given a story, purpose, and reason for being traversed – from Dust to Italy to Office and more, but all within the confines of three progressive campaigns.

But wait, there's more! Hardwired tweaks and tones the engine to provide features such as bullet time, particle and explosion effects, screen effects such as motion blur and depth of field for zooming, improved ragdoll effects, lighting effects including a faux HDR and more all configured through a 12-step configuration module.

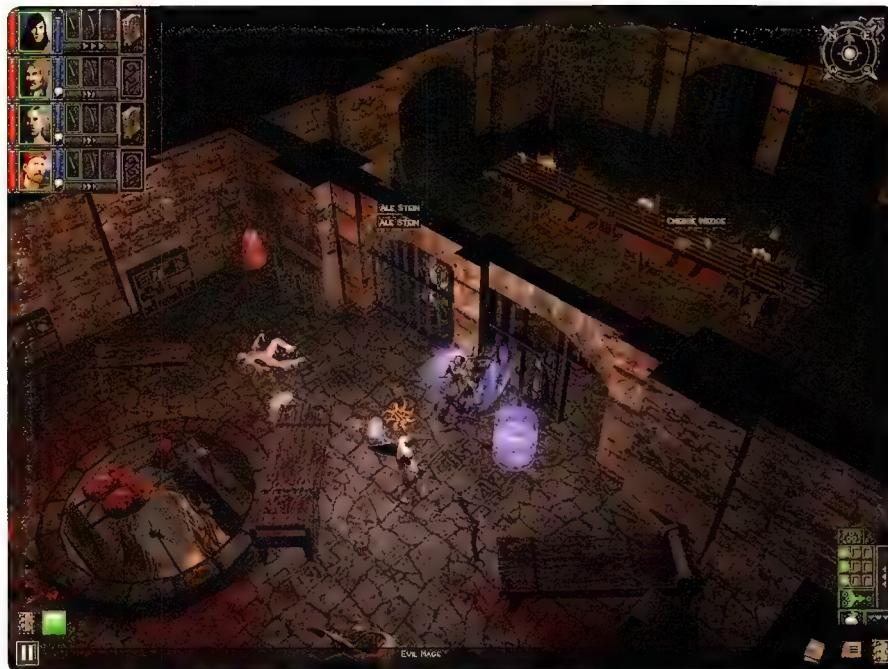
And you get to play with plenty of your favourite weapons plus some special toys like the Airboat Gun, Gauss Gun, Flare Pistol, Laser Rifle and my favourite the Hopwire Mines. I've discovered there really isn't anything more satisfying than seeing Combine, Headcrab Zombies, and cars all get sucked into a singularity, all in the name of saving the universe (or at least, completing the sequence of missions).

Hardwired is definitely a labour of love, and shows yet again the longevity and flexibility of

Valve's Source engine. Put this on your 'games worth staying home for instead of a date with that hot chick' list along with Crysis 2 and Homefront, because it's worth it.

* (I'm not the only one who has this list, right? Um... right?)





U6 Project 1.0

Game Dungeon Siege
URL u6project.com

Lord British, is that you? Why, it's been so long dear friend. Not since those Ultima days have you been so grand, it's good to see you again!

At least, in some form – the U6 Project was designed to bring back the classic Ultima 6: The False Prophet, released in 1990, as a mod



for a more modern engine, giving it a real virtual (real virtual? you know what I mean) 3D feel through the use of the ultra-modern Dungeon Siege engine. Wassat? Dungeon Siege isn't modern any more? Well it was when the U6 Project began – nine years ago. Yes, this is a mod almost ten years in development, and it only just recently hit a final version 1.0 release.

That's passion and dedication for you.

So if you're an Ultima fan (anyone over 30 here should be nodding their head vigorously) dust off that copy of Dungeon Siege because you're about to re-live your childhood again. (booming voice) *Only in glorious 3D!* (booming voice). Okay, that doesn't sound as amazing as it once would have, but there you go.

The U6 Project takes you back to Britannia following the same original story (at war with the Gargoyles – but nothing is as it seems), only now with hindsight by adding or improving upon story threads and fixing the continuity



The month's essential patches.

Singularity Patch v1.1

Mass Effect 2 v1.02 Patch

ArmA 2: Operation Arrowhead Patch v1.50 to v1.52

World of Warcraft Patch v3.3.5 to v3.3.5a

Risen Patch v1.10

Football Manager 09 Patch v9.3.0

Conspiracies: Rising Dead 2 Mod Patch v1.05 for ArmA 2

Atlantica Online Patch v21605 to v21704

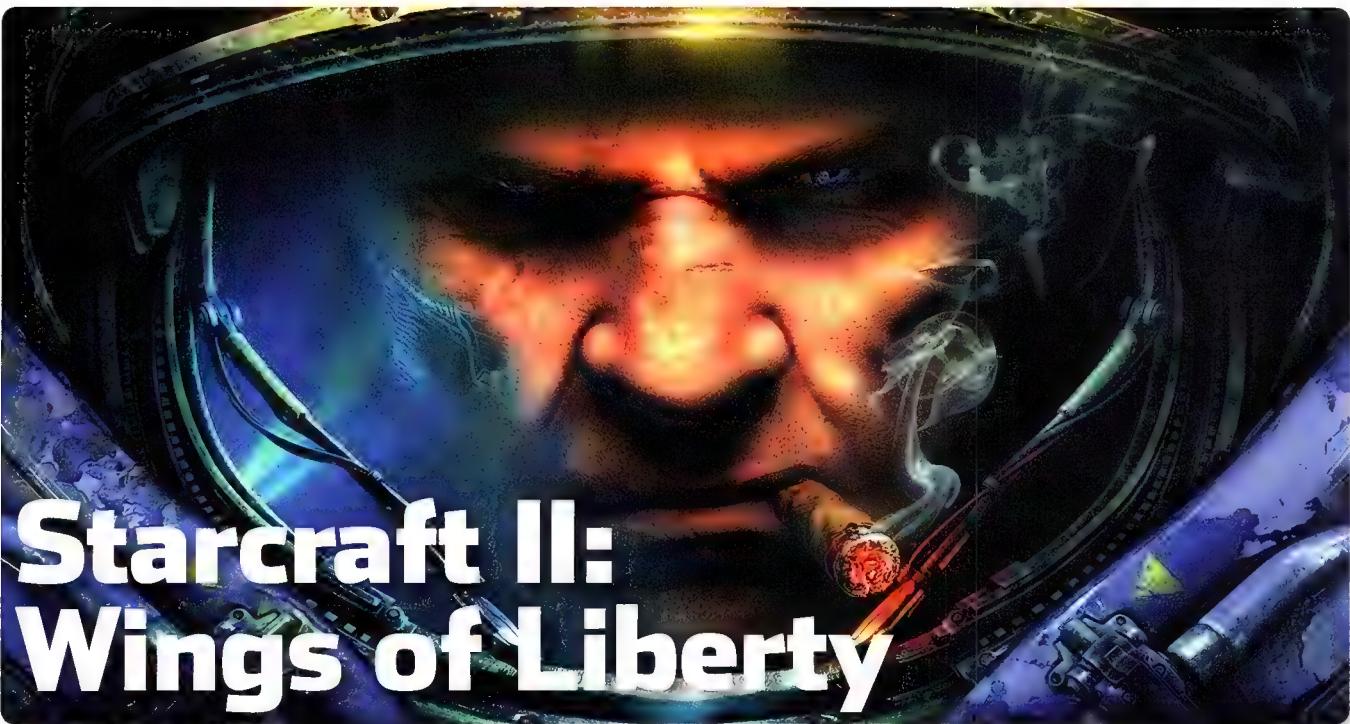
Grand Theft Auto 4 Patch v1.0.7.0

BioShock 2 Patch v1.0.0.3

issues of the original. Additionally the war between factions has been fleshed out and, while it sticks to the much of the same spells, weaponry and NPCs there are a few new ones thrown in as well, and an improved score to boot (which you'd somewhat hope for, unless you have a passion for beeping MDIs). Otherwise, it's Ultima to the core.

It's clear that the imagination inspired by the Ultima series lives on – there were some 10,000 downloads of the U6 Project in its first week of release. Now, where did I put my copy of Dungeon Siege...





Starcraft II: Wings of Liberty

After twelve years it's actually here... but has the wait been worth it?

How the hell do you objectively review a game like Starcraft II? For a game that's only just come out, it's been a part of the public gaming consciousness for a decade. We've been seeing screens, gameplay previews and footage, and interviews with the devs for years now. Whole swathes of the game's tech trees and the tactics needed to utilise them have been up for discussion for the better part of this year.

Now that it's here, on our machines... how do we come to grips with a phenomenon that's just a shade below the Second Coming?

While Justin visited Blizzard HQ and wrote countless articles and previews, I've only just gotten the full, final build. I even avoided the beta testing phase, so I could really gauge the game 'out of the box'. Even that experience was totally unlike any other game we've ever reviewed – we had sweaty palms just waiting for the first game to load. It was like that giddy excitement that Star Wars fans felt waiting for that first text crawl when *The Phantom Menace* was released.

And then we played...

Let's get this out of the way

Starcraft II is a good game. Actually, more accurately, it's a great game, dripping with passion.

Take the weather-beaten visage of main character, Jim Raynor, the first thing you see when you spring into the game's campaign. As much thought has gone into the look and feel of this character as any Hollywood blockbuster, and as the game progresses you get a deeper and ever more insightful look into his being. He's a freedom fighter, a man of conviction; but he's

tired too. He's fought, he's won, but it's the losses that are starting to wear on him.

Which might seem an odd thing to say about an RTS, but the big surprise that Starcraft II delivers is the game's campaign. We always knew multiplayer would be good, but the single-player campaign is something else again, and shows off everything that Blizzard's been learning about storylines thanks to their other titles.

At the game's start, Jim's a rebel, fighting back against the oppressive regime of Emperor Mengsk. Joined by an old friend with a shadowy past, Raynor goes on the warpath, and before long his simple fight for freedom becomes one of desperate survival as the Zerg resurge, and

Mengsk rears his ugly head once more.

The first three missions serve as a pretty gentle reminder of the game's basics. There's an extensive set of tutorials for the terminally unaware, but really you can just dive right in and it'll all come back to you. From having just basic Marines you soon start to open up new units, mess about with base-building and proper resource management, and then, after mission three, the campaign proper opens up.

Blizzard's taken a leaf out of Relic's book when it comes to the campaign's structure. You'll be able to choose which mission to take and when, unlocking new units and options as you go.





The hub of all things

The entire prosecution of the campaign, short of the first few missions, is from your own personal Battlecruiser, which boasts four locations to visit and control your campaign – the armoury, the cantina, the lab, and the bridge. Between these locations you can spend cash to improve your troops and buildings, unlock new research options, or hire mercenaries.

Even before you get on the battlefield, good choices will shape how you play, and enhance the game styles you favour.

For instance, if you like turtling behind a ring of turrets, you'll want to spend money on boosting their capacity, and buy an autogun upgrade. Of course, this is at the expense of other upgrades. Similarly, for every research item you unlock, another becomes unavailable.

You can also chat to any number of NPCs on the ship, unlocking various storylines and bits of game info. It's particularly fun to watch the news feed, to see what lies the Mengsk-sponsored channel is broadcasting about you.

The real meat of the game, though, are the missions themselves, and Blizzard's done a wonderful job of coming up with fresh and exciting missions to keep you pushing through

the game. There are old favourites, like the "Hold out until" rescue mission that was so tense in the first game, to new missions that take advantage of the more robust new engine. In some, you must contest with a day/night cycle that changes unit behaviours, while in another early mission, lava regularly floods the low levels of the map. Deft timing, good use of choke points, and efficient resource spending is key.

The ebb and flow of the game is, however, more or less unchanged. The fact is, Blizzard got it right first time around, and Starcraft II harks back to that now classic formula. However, there are subtle changes to almost every aspect of the game that not only keep it fresh, but open up very interesting new options. Take the humble Supply Depot, for instance. This can now be raised and lowered into the ground, making it even more useful to use to build choke points around your base. It's this evolution of gameplay based on the habits of the best players in the original which has made Starcraft II such a natural and welcome progression.

But...

This is something which is still bit of a sore spot. The new Battle.net service really is slick, and its integration with things like Facebook make

hooking up with friends easier than it's ever been. But we still don't support Blizzard's decision to remove pure LAN-based gameplay.

For many, that's the one big memory of the original game. We know of some early home network setups that were rigged purely to support massive games of Starcraft. But that's gone now. Sure, we get one of the most in-depth Achievement systems we've ever seen, great social integration, and superlative league support and match-making... but we also rely upon Blizzard up-time for any kind of multiplayer.

We've already experienced a couple of outages. This is always going to happen at launch, we admit, but it only highlights an issue not unlike the recent Ubisoft DRM woes – that basically, we're paying for a potentially handicapped product.

Those issues aside, Starcraft II multiplayer is like an entirely different game, and one that's near impossible to fully cover in such a small space. The depth of unit balance and tactical gameplay is arguably the deepest yet seen in any RTS, and we expect the entire flavour of the game to flow and change as new tactics are learnt and counters developed. Rest assured, whoever, that when it all comes together, this will be the new standard in competitive RTS play.

Starcraft II is, at the end of the day, one of the most polished games we've ever played – as it should be, given the development time. It's not perfect – Battle.net integration, lack of anti-aliasing, etc – but it is great. Now, excuse us, because we need to go see a man about a Zerg... DH

PC

Developer: Blizzard
Publisher: Blizzard
Website: www.starcraft.com

Gameplay

Rich and deep, with a superlative campaign. Battle.net not ideal though.

Graphics

Very shiny and super-detailed units, but missing advanced options.

Sound

Solid voicing and some great music.

92
85
90

Overall:
A game worth waiting twelve years for.

89%





Disciples III: Renaissance

The latest iteration of the Disciples strategy series promises epic fantasy action, but delivers simple yawns.

There is an awful lot to like about Disciples III. There's a rich story, deep and detailed background to explore, and some of the finest art we've seen in a game outside of the Final Fantasy series. Plus it's a PC strategy RPG, so it's always nice to get lost in some great gameplay.

Except for the one thing – Disciples III doesn't have any. To cut straight to the chase, the experience of starting up the game's so-called 'epic' campaign following the hour or so of forced reading on the game's history and setting was one of the most disappointing gaming experiences in recent memory.

It's almost worth leaving it there, but we have pages to fill, so let's get to recounting this epic tale of fantastic disappointment.

In the beginning

Disciples III is an old-fashioned game. It's the kind of game that in the days of gaming's youth would have likely come with a cloth map, the odd metal figurine or some other bumpf. You can tell this from the sheer size of the manual, and from how much of that manual is taken up by backstory for the game.

It's over 90 pages long, and the first 20 of that is history – the kind of impenetrable, dramatic and overtly derivative history that just makes us want to re-read Tolkien's *Silmarillion* just to see that kind of thing done well. There's only so many times we can read lines like "They planted the seeds of greed and malice in the hearts of men, which, in turn, led them to struggle first with each other, and then – with the other races of Nevendaar".

In fact, it's so derivative of Tolkien's own creation

tale – God empowers lesser beings to create world, lesser beings show off, God gets angry, world gets screwed over – that we're sure the old Professor is spinning in his grave.

There's nothing wrong with derivative works as long as they're backed up by something solid, as we said in our Warhammer feature only a few pages earlier. But that's where Disciples falls down, and it falls hard and fast very early in the game.

Tutorial fail

Disciples looked like a bit of a slog from the onset of the tutorial – never a good sign. Ideally any game tutorial should offer a gentle introduction to the tenets of a game, its mechanics and setting, and see most players ready to dive in.

This tutorial just left us wondering, slightly confused, about how we were meant to progress.





There are videos, and small quests to do in the top down game-world, but the order in which to complete them is not all that clear. We stumbled through it anyway, and our confusion turned to mild alarm at just how little there is to the game.

The gameplay basics of Disciples III aren't just simple - they're rudimentary. You choose a character from one of three 'classes' (though don't expect any kind of customisation options), then get to move him around the world map from encounter to encounter. Oddly, you need to extend movement points to get from A to Z, though we're not sure why - movement in the

gamework is turn based, but it's not as if you've got anything other than moving to do. You move, you pick up stuff, or you encounter badguys and go to a tactical map.

In the first quest of the campaign you've got to recover some mythical star that's fallen to earth or somesuch; you leave town, head into the wild and encounter all kinds of goblins, orcs and elves trying to stop you. Along the way you can claim territory by placing Border Guardians, which in turn will block any other wandering nasties.

Apart from how depthless this part of the game is, the other big issue is how boring early

combat is. Each tactical map is a hexed grid with a few interesting spots like fallen logs that block movement or random hexes and spells that deliver an attack bonus. Each character on the map, good and bad, moves in a given initiative order and delivers their attacks... but that's about it! There's no depth - archers stand still and shoot, warriors simply move up and swing swords; sure, it's easy to learn, like Chess, but it completely lacks in any complexity. This is compounded by an AI that seems as likely to get lost in movement decisions as it is to actually attack you!

There's a whole host of other systems to manage, like building new bits onto your home castle, but even these are an odd combination of boring and complex. And why can't you skip the short clips of, for instance, your magic tower being built - that's five gaming minutes we're never getting back, that's for sure. It's like every other sub-system in game, without depth.

And yet, there's the oddest thing - we have been going back to play the game. We're not enjoying the game, per se, but the art is some of the best fantasy art we've seen, reminiscent of some of the great Japanese fantasy artists, with a touch of Alan Lee thrown in. It's wonderful stuff, and sadly wasted on this title.

Maybe we need to see if we can hack the game files to get access to it all - it would certainly save us the joyless task of actually playing Disciples III. **DH**



PC

Developer Akella
Publisher Strategy First
Website www.disciples3.com/

Graphics
Great art with a competent engine.

73
40
50

Gameplay
Depthless, boring, and repetitive.

Sound
Music you'll want to mute. Fast.



Overall
The so-called epic that we just can't wait to uninstall.
55%

Make Battlefield Bad Company 2 run faster

As well as being great fun, Battlefield: Bad Company 2 is a seriously hardware-hungry game. We take a look at how to get the best performance without compromising on the luscious visuals.



Bad Company 2 has four main graphics settings: level of detail, texture quality, shadow detail and effects detail. There's also the usual array of anti-aliasing and anisotropic filtering, as well as HBAO (horizon-based ambient occlusion).

Setting everything to maximum will prove a challenge for hardware such as the GeForce GTX 260, and even more powerful cards such as the HD 5850 won't be able to keep up the frame rate at higher resolutions with AA enabled. So what's a keen soldier to do? Don't panic; with a few clicks, we'll have healthy frame rates.

1 The absolute best tweak is to disable HBAO; this is a huge performance sink, dropping average frame rates in our testing by as much as 16fps when enabled. Worse still, the visual differences between having HBAO on and off are so minor that you'll struggle to spot them even when you're looking for them, let alone concentrating on blowing up Russian tanks.

2 Level of detail (LOD) has a big impact on performance, but set it to low or even medium and you'll notice poor textures as you move closer. Low trees and foliage look dreadful. The trade-off is up to a ten per cent frame rate jump when dropping from high to medium, and up to 16 per cent dropping to low. However, the look of the game suffers to such an extent that we'd recommend keeping LOD on high, or at least medium, if you're struggling for a faster frame rate.

3 Texture quality makes very little difference to Bad Company 2's visuals, whether it's up close or from a distance. Dropping this setting from high to low, we were unable to notice any differences even in detailed buildings or characters, while the frame rate was better, so feel free to adjust this down.

4 With shadow detail there's a big difference between low and medium detail - low detail shadows are horrible blobs, while medium shadows are correctly drawn, if a little blocky when you're up close. High detail shadows are slightly better again but will generally drop performance by around 5 per cent. As

there's no difference in shadow draw distance between medium and high shadow detail, we recommend using medium.

5 Finally, there's effects detail, which adjusts the detail in explosions and the complexity of debris and smoke. This is a tough setting on which to compromise, as a big part of any game, especially Bad Company 2, is blowing up stuff, and we saw little differences in the frame rates when blowing up houses with low or high effects details. Keep it set to high and revel in those explosions.

6 It's also worth mentioning anti-aliasing and anisotropic filtering, both of which have a big impact in visual quality. With AF, there's only a tiny performance difference between 1x and 16x, so feel free to bump this up nice and high. AA is a little trickier and is very reliant on which graphics card and drivers you're using. While turning off 4x AA off can buy you over 25 per cent higher frame rates in some circumstances, you should be running at least 2x AA if only to even out jagged edges, and 4x AA if you can spare the performance.



Why don't I need HBAO?



HBAO or horizon-based ambient occlusion is a new method of ambient occlusion, a lighting model that allows in-game objects to affect the lighting of other objects around them beyond simply casting a shadow. Horizon-based ambient occlusion takes this one step further, calculating gloom and darkness around objects from multiple heights based on the horizon using complex maths such as tangent plane calculations. The result is more accurate lighting, especially inside buildings where edges between two surfaces such as a wall and ceiling will appear darker without casting a shadow. Bad Company 2 is one of the first games to make use of HBAO, but the performance hit is huge, equivalent to enabling 4x anti-aliasing. While there's a slight difference to visuals, in our opinion, it's so minor that disabling HBAO is the best way to increase your frame rates without compromising on visuals.



The numbers don't lie

We used a Core i7-920 system with 6GB of DDR3 and a GeForce GTX 260-216 896MB graphics card to test our Bad Company tweaks, playing through a section from the third mission, Heart of Darkness. We tested at 1920 x 1200 with 4xAA and 16xAF; this is a demanding resolution, but it clearly indicates the differences between detail levels. With all the graphical shininess enabled, we recorded an average of 33fps and a minimum of 22fps. At these settings, the game was noticeably chuggy.

Disabling HBAO saw the average jump to 45fps, with a 27fps minimum - this is a big improvement for little visible loss of detail. Next, we tested with HBAO disabled and all the presets at medium; this resulted in a 53fps average and 28fps minimum, which isn't a great return - the minimum fps is just 1fps faster.

Finally, we set LOD to high, texture quality to low, shadow detail to medium and effects detail to high, with HBAO disabled, resulting in an average frame rate of 48fps and a minimum of 31fps. These settings were the best balance of visual quality and performance, and if you're struggling to keep your Bad Company 2 frame rates up, they're definitely worth a try.

Battlefield Bad Company 2 1920x1200 4xAA 16xAF

High detail, HBAO on	22fps	33fps
High detail, HBAO off	27fps	45fps
Medium detail, HBAO off	28fps	53fps
Custom detail, HBAO off	31fps	48fps

Make ARMA II: Operation Arrowhead run faster

The 'Advanced' section of the 'Video Options' menu contains 11 separate settings that you can tweak, each with multiple variables. This is what these settings do and how we recommend configuring them.



IN-GAME TWEAKS

VISIBILITY: Unlike most games which have a fixed rendering view distance, this option can be adjusted in Arma II. The default is 1,600m; this is more than most games and sufficient for the operation of most infantry weapons, but totally inadequate for flying or controlling a tank. However, you need to be careful which setting you select, as the view distance affects the frame rate more than any other setting.

For example, at 1600m, our test system (a Core i7-930 with a Radeon HD 5870) had a minimum frame rate of 22fps and average of 50fps. However, when we increased the view distance to the maximum 10000m, the frame rate plummeted to an unplayable 10fps minimum and 26fps average. In the end, we compromised on 3000m, with a minimum of 19fps and average of 46fps.

RESOLUTION: Arma II provides the unique ability to set the 'Interface Resolution' and '3D Resolution' independently. The Interface Resolution controls the in-game menus and HUD, such as the compass and radio command interface. Meanwhile, the 3D Resolution is the game world itself – basically, what your game avatar can see.

The benefit of this dual-resolution approach is that if your PC isn't powerful enough to run the game at a high 3D Resolution, you can still set a high Interface Resolution and

enjoy sharp menus.

In contrast, adjusting the 3D Resolution has a massive effect on image quality and frame rate. For example, with the 3D Resolution set to the same 1920 x 1080 native as the Interface Resolution on our test system, the game trundled along with a minimum of 22fps and average of 50fps. However, adjusting this to 200 per cent – an effective 3D Resolution of 3840 x 2160 – killed the frame rate, sending it plummeting to 16fps and 23fps. However, the game world looked much crisper, with more highly detailed textures and less jaggies than at 100 per cent, so we decided to try an intermediate setting.

Unfortunately, even at just 133 per cent, the frame rate was still poor, at 19fps and 39fps respectively. This means that unless you have a more powerful graphics card than an HD 5870, we recommend setting the 3D Resolution to be the same as your Interface resolution.

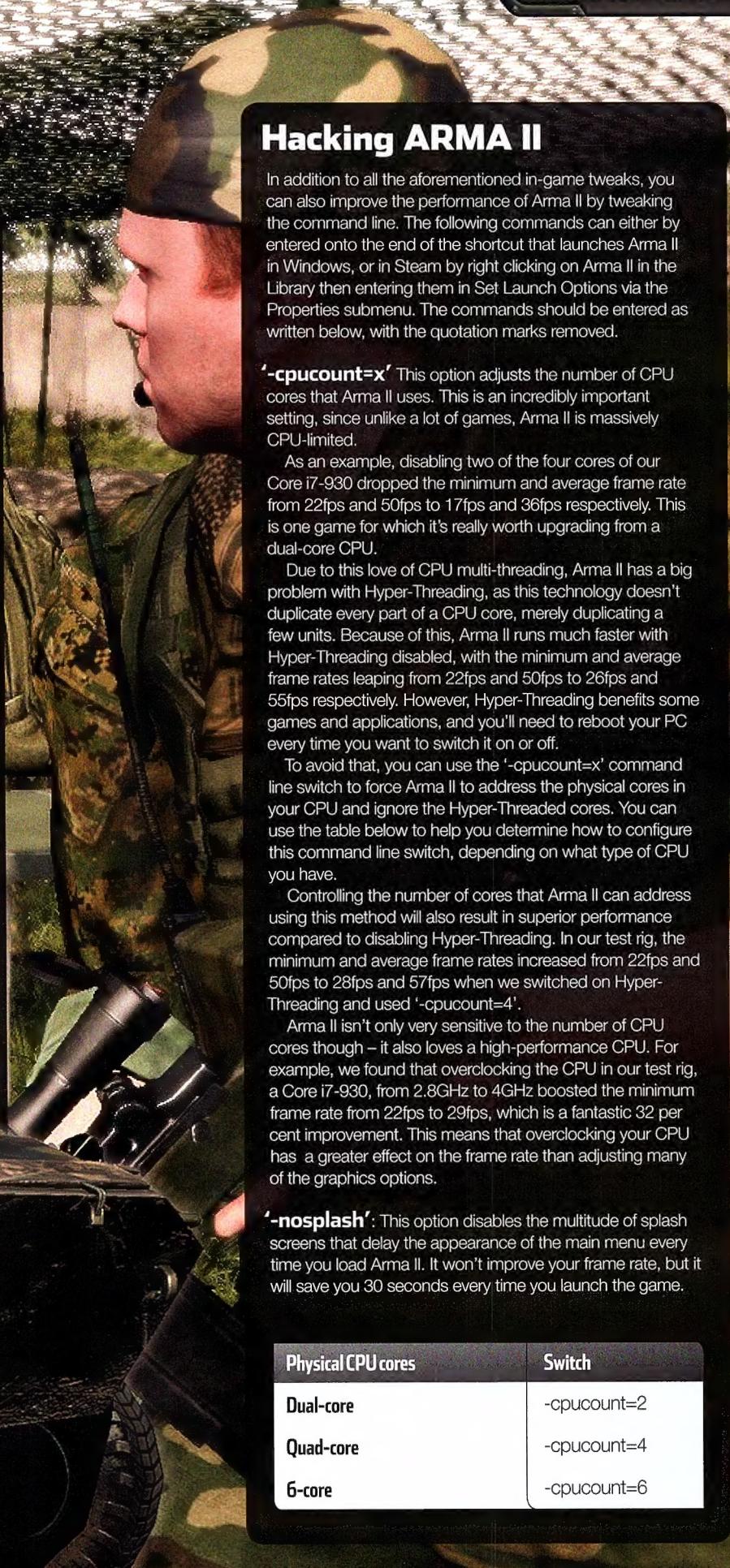
TEXTURE DETAIL: This option also has a big effect on the frame rate, dropping the minimum by 27 per cent and the average by 18 per cent when changed from Normal to Very High. However, it makes a big difference to the image quality of every object in the game world, so we'd recommend setting it to High or Very High if possible.

ANISOTROPIC FILTERING

AND ANTI-ALIASING: Both of these options will also cause a big dent to your frame rate. However, we highly recommend increasing the AF beyond the Normal default,

as Arma II has such a high view distance compared with most games. You can expect a reduction of around 14 per cent to your minimum frame rate by changing the AF from Normal to Very High. Changing the AA by the same amount will hurt your frame rate even more, although it has a greater effect on the average frame rate than the minimum. However, if you have a powerful PC, you can achieve a similar effect (and improve the clarity of textures) by increasing the 3D Resolution instead of the AA.

TERRAIN DETAIL: This option adjusts the distance from the player at which small objects such as grass and rocks are rendered. At Low, these objects are only rendered a few metres away from the player, so they pop up in an obvious and annoying way every time you move around the game world. However, since Arma II has such varied maps, changing this setting doesn't have a consistent effect. For example, on top of a barren mountain, it barely has any effect, as there's little to render, so you can set it to Very High. In contrast, in forests or grassland, you'll probably have to settle for Normal or High, otherwise the lush flora will cripple your PC.



Hacking ARMA II

In addition to all the aforementioned in-game tweaks, you can also improve the performance of Arma II by tweaking the command line. The following commands can either be entered onto the end of the shortcut that launches Arma II in Windows, or in Steam by right clicking on Arma II in the Library then entering them in Set Launch Options via the Properties submenu. The commands should be entered as written below, with the quotation marks removed.

'-cpucount=x' This option adjusts the number of CPU cores that Arma II uses. This is an incredibly important setting, since unlike a lot of games, Arma II is massively CPU-limited.

An example, disabling two of the four cores of our Core i7-930 dropped the minimum and average frame rate from 22fps and 50fps to 17fps and 36fps respectively. This is one game for which it's really worth upgrading from a dual-core CPU.

Due to this love of CPU multi-threading, Arma II has a big problem with Hyper-Threading, as this technology doesn't duplicate every part of a CPU core, merely duplicating a few units. Because of this, Arma II runs much faster with Hyper-Threading disabled, with the minimum and average frame rates leaping from 22fps and 50fps to 26fps and 55fps respectively. However, Hyper-Threading benefits some games and applications, and you'll need to reboot your PC every time you want to switch it on or off.

To avoid that, you can use the '-cpucount=x' command line switch to force Arma II to address the physical cores in your CPU and ignore the Hyper-Threaded cores. You can use the table below to help you determine how to configure this command line switch, depending on what type of CPU you have.

Controlling the number of cores that Arma II can address using this method will also result in superior performance compared to disabling Hyper-Threading. In our test rig, the minimum and average frame rates increased from 22fps and 50fps to 28fps and 57fps when we switched on Hyper-Threading and used '-cpucount=4'.

Arma II isn't only very sensitive to the number of CPU cores though – it also loves a high-performance CPU. For example, we found that overclocking the CPU in our test rig, a Core i7-930, from 2.8GHz to 4GHz boosted the minimum frame rate from 22fps to 29fps, which is a fantastic 32 per cent improvement. This means that overclocking your CPU has a greater effect on the frame rate than adjusting many of the graphics options.

'-nosplash': This option disables the multitude of splash screens that delay the appearance of the main menu every time you load Arma II. It won't improve your frame rate, but it will save you 30 seconds every time you launch the game.

Physical CPU cores	Switch
Dual-core	-cpucount=2
Quad-core	-cpucount=4
6-core	-cpucount=6



OBJECTS DETAIL: If you want to identify whether a soldier in the distance is carrying an M16 or AK47, you should maximise the object detail. As the object detail has an effect on the frame rate, dropping the minimum on our test PC from 22fps to 19fps and the minimum from 50fps to 38fps when changed from Normal to Very High, you may have to sacrifice other settings to obtain a playable frame rate.

SHADOW DETAIL: Changing this setting from Normal to Very High will reduce your minimum and average frame rates by as much as 17 per cent. If you're mostly playing as an infantryman, it's worth using High or Very High, as the soft shadows cast by flora and fauna are a joy to behold. However, as a pilot, you can get away with using Normal, since you'll be flying at such high speeds that you'll barely have time to appreciate shadows.

POSTPROCESS EFFECTS: This option covers a range of advanced graphical effects, such as motion blur, depth of field and SSAO. This option is mainly down to personal taste; some gamers prefer the sharp simpler graphics of the Low or Normal settings while others prefer the softer but more cinematic graphics provided by the High or Very High settings. This option doesn't affect the minimum frame rate by much, but it will drop the average by around 20 per cent.

The Open Road

For five amazing years rFactor has been delivering absolute sim racing realism. Ben Mansill starts his engine and introduces pedal to metal.

Racing games rank as a top genre wherever you choose to poll. But new racing game releases on console far outnumber those for PC, with a mass of excellent titles ranging from a bazillion arcade racers through to the majestically awesome Forza and Gran Turismo series. You'd think, then, that the PC is relatively starved of proper racing games. Apart from infrequent releases from Codies and Simbin there doesn't seem to be much that justifies a \$200 spend on a sexy Logitech wheel.

Fact is, though, that the PC racing scene has been boiling along at a breakneck pace for years now, all thanks to the mighty and little publicised rFactor. Unless you go looking for it, it's a game that's only visible to those who love the virtual road, and it's those folk that have made it what it is today.

Originally released back in '05 by Image Space Incorporated (ISI), rFactor was in turn built upon the engine used in EA's F1 Challenge series, which covered five games from 1999 to 2003. The same engine was used by Simbin for its highly regarded GT sims.

ISI has an outstanding pedigree that elevated the quality of rFactor way above the relatively simplistic modelling seen in the F1 Challenge games. The company does PC games as a bit of a sideline; its main business has always been ultra-realistic simulators for the military and specialised jobs for niche customers. If you've been watching the Formula 1 telecasts this year they show Aussie Mark Webber demonstrating that weekend's track in Red Bull's mind-blowing simulator. It's a mother of a beast with wrap-around screen and insane hydraulic motion actuators. Well, that runs ISI's pro simulation software, and it shares many elements with the rFactor we non-Mark Webber folk can buy.

Dynamic accuracy is all. A complete fifteen degrees of motion freedom are modelled for the vehicles. Of particular note is the way the tires are modelled, which is completely non-linear, so wear is based on real factors like varying temperature and scrub from varying track surfaces. The net result is that it feels real.



Smooth driving, Jenson-style, will preserve your tires a bit longer, while gunning it a la Lewis will quickly rub away the grip. Different tyre compounds make a huge difference too and it's all modelled properly, unlike some other 'sims' that dictate, say, 50 per cent loss of grip at 50 per cent race distance.

These are cars you drive. None of the rubbish where you spend an hour with a new game figuring out what the developers reckon is right. Nope, with rFactor you just get in a car and drive it and it'll behave the way it should. The whole idea of doing this with racing sims was pioneered by Papyrus and its revered Grand Prix Legends, which modelled the individual components of the car's suspension and chassis, each with accurate attributes all working together to produce a road feel that was natural, intuitive and bloody exciting.

As nice as this is, the sim would have shone for a year then faded away, as they all eventually do. The masterstroke with rFactor is its totally open code for modders. For all these years not a day passes without something new from the community. From wee things like new car textures, through to all-new cars and tracks, all the way up to total conversions that model a complete racing series or formula. And they're good. Really good.

I can't help but wonder if the comprehensive range and frequency of rFactor mods is at least partially responsible for the lack of first party racing sims over the last few years. rFactor mods are free when, really, so many of them could easily warrant some level of cost to purchase. Dedicated rFactor mod groups like MMC, CTDP and FSOne produce stuff that's of the highest imaginable quality. F1 fans are stunningly well catered for, with mods covering seasons a first party developer would never



bother with. Team ORSM (great name) locally release V8 Supercar mods that are up in the top echelon of rFactor mods. The group's Bathurst track is rated as amongst the best of all time, and must have gone a long way to popularise our brilliant mountain track to international race fans. Another local group, Ausmodders, have produced the brilliant Bathurst 1971 mod so you can pelt around in the legendary GTR XU1 Torana, GTHO Phase 3 Falcon and other heart stirring Aussie hero cars.

Racing cars on tracks that aren't their rightful home is another sweet rFactor treat. Taking an F1 car on a dirt rally track is nutty awesome, or ripping up a mountain climb in a European supercar... the possibilities are massive. Imagine a car or track and it's probably in rFactor. Some are well served in abundance – there must be hundreds of Porsche 911s to download.

Online is rFactor's other mighty strength. There are league and casual races on pretty much any time of the day and night, seven days a week. Suck on that, generic one week old spec ops shooter with empty servers! Racing leagues are great ways to make friends with like-minded car fans, just as long as you treat it all with proper respect. No driving around the track backwards in this fandom!

rFactor 2 is due out imminently and will be the 'Starcraft 2' to sim racers, spawning a fresh new thrust of mods and league racing, while the original will thunder along for many years to come. 



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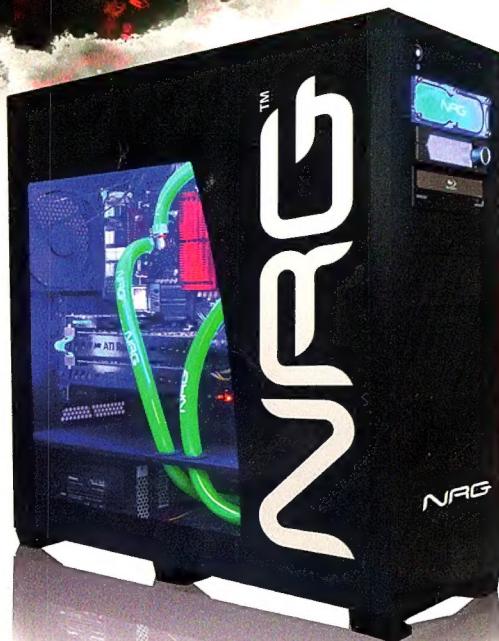
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